GAS

ENGINEERING • UTILIZATION • LOAD-BUILDING • MANAGEMENT

MAY 6 1947

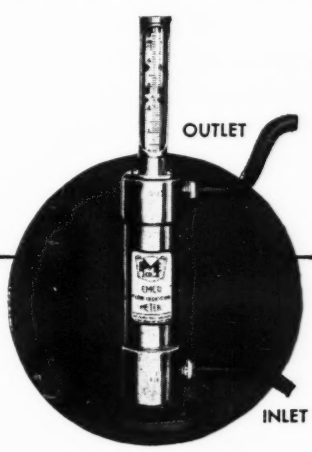
T ENGINEERING
LIBRARY

DRESS UP YOUR GAS APPLIANCES . . .
Improve Their Performance
WITH NEW Rockwell-Emco APPLIANCE REGULATORS

★Today you want eye-appealing controls to harmonize with the streamlined proportions of your new appliances. And you should demand superior performing pressure controls to assure the higher burner efficiency that has been so carefully engineered into your products. Both of these necessary qualities—appearance and performance, are found in Rockwell-Emco Gas Appliance Regulators. Made with pressure cast aluminum alloy bodies and covers, they are durable and non-corrosive; feather light to save in shipping and handling. Their careful, studied design provides the maximum in operating efficiency and functional accuracy. Write for bulletin 1136.

Sectional view, Rockwell-Emco Appliance Regulator

PITTSBURGH EQUITABLE METER DIVISION
ROCKWELL MANUFACTURING COMPANY, PITTSBURGH 8, PA.
ATLANTA BOSTON CHICAGO HOUSTON KANSAS CITY LOS ANGELES
NEW YORK PITTSBURGH SAN FRANCISCO SEATTLE TULSA



THE HANDIEST TOOL IN THE APPLIANCE MAN'S KIT

EMCO FLOW INDICATING METER

Want to save time and money when installing or adjusting appliances? Just outfit each of your appliance service men with a handy Emco Flow Indicating Meter. Reads directly in cfh. Has accuracy comparable to that of dry test meter. Made in three sizes, all readily portable. Carrying cases available. Economically priced. Ask for bulletin 1037.

RELIANCE REGULATORS

forge the final link...

...in Domestic Gas Service

GAS has quite a history from oil field to oven. It's the story of well drilling and gas testing. It's the romance of a molecule of CH_4 from the compressors, out through the lines to the meter and the regulator. Gas follows all the links in this chain. But it has a single purpose, the supplying of peak heat under rigid regulation.

With regulation comes customer satisfaction – the achievement of oven excellence, low cost operation, and minimum servicing. The home regulator is your perpetual retail gas salesman. It is the last telling contact of company with customer. Only through proper home regulation can the many controls of the gas industry be kept satisfactorily at work in the consumers' homes.

Realizing its role as a vital link in the gas chain, Reliance has made reliable home regulators. The Reliance type K and H regulators have high capacity because the toggle joint action allows the valve plunger to move directly away from the valve orifice. The toggle joint cannot go beyond center because of the stop in the upper diaphragm chamber. Complete lockup occurs when no flow exists, due to this powerful toggle action.

Different size valve orifices are easily interchanged by removing the end pipe plug and inserting a hexagon wrench into the recess provided in the valve body.

Valve seat discs are easily accessible through the inspection plug in the side of the Regulator. Valve discs come in either leather or composition material; the leather diaphragms being bark tanned or semi-chrome, specially treated for long service, flexibility and tightness. Composition diaphragms can also be provided where required.

Varying inlet and outlet sizes are available ranging from ¾" to 2". These regulators will control inlet pressures up to 75 pounds and outlet pressures up to 22 inches water column with the proper spring, and can also be equipped with automatic shut-offs and safety relief valves in all sizes when required.

These are some of the reasons why Reliance Regulators have stood the test of time and have given years of continuing satisfactory service.

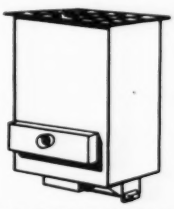
Write for Bulletins 38 and 41.

AMERICAN METERS

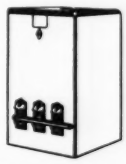
RELIANCE REGULATORS

EYES RIGHT!

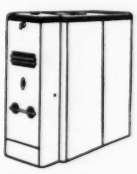
and Payne Gas Heating Units are right!



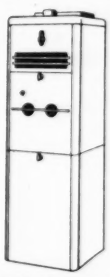
FLOOR FURNACE



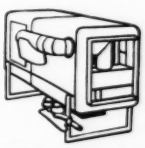
GRAVITY FURNACE



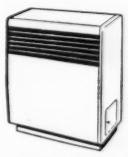
ZONEAIR UNIT



SENTRY UNIT



SPACESAVER



CONSOLE

Inspection of various types of PAYNE gas furnaces reveals two important facts: There is a time-tested model for every heating need, residential or commercial, and *each* type and model reflects over a third of a century of specialized experience and engineering leadership.

PAYNE gas furnaces are *right* because they are designed right, built right and perform right; and because they use the right fuel, gas—the fuel that "has everything."

All these facts add up to owner satisfaction, which in turn is a source of satisfaction and profit to dealer and utility.

PAYNE FURNACE COMPANY

(One of the DRESSER Industries)

BEVERLY HILLS, CALIFORNIA

GAS FUEL HAS EVERYTHING

Paymeheat

OVER THIRTY YEARS OF LEADERSHIP

Advertisers

American Cast Iron Pipe Co. 8
American Radiator & Standard Sanitary Corp. 81
American Recording Chart Co. 84
American Stove Co. —
Ansul Chemical Co. —

Barrett Division —
Blaw-Knox Co. 25

Carbide & Carbon Chemical Corp. —
Cast Iron Pipe Research Association 6, 7
Clark Brothers Co., Inc. —
The Cleveland Heater Co. 90
The Cleveland Trencher Co. —
Connelly, Inc. 96
Consolidated Industries —
The Cooper-Bessemer Corp. 19
Crane Co. 20
Cribben & Sexton Co. 76

Day & Night Manufacturing Co. —
Dearborn Stove Co. 75
Detroit Brass & Malleable Works 10
Detroit Lubricator Co. 14
Detroit Mich. Stove Co. —
Dresser Industries, Inc. 1, 11, 15
Dresser Manufacturing Division 15

Empire Stove Co. —

Fisher Governor Co. 5
Florence Stove Co. 63

General Controls Third Cover
General Gas Light Co. 72
General Paint Corp. Hill Hubbell Division 88
Grayson Heat Control 22
Greenlee Tool Co. 79

Hammel Radiator Engineering Co. 89
Hardwick Stove Co. Fourth Cover
Harper-Wyman Co. 65
Heckethorn Mfg. & Supply Co. 86
Hydrauger Corp., Ltd. —

Inland Manufacturing Co. 92

Johns-Manville 93

Kitson Co. —

Lake Chemical Co. 98
The Lattimer-Stevens Co. 98
Lee B. Mettler Co. 97

Milwaukee Gas Specialty Co. —
Minneapolis-Honeywell Regulator Co. —
Mueller Co. 4

Naco Mfg. Co. 93
Natural Gas Odorizing Co. 94
National Tube Co. 21
Nordstrom Valve Co. 17, 18
Norton-McMurray Manufacturing Co. 91

Ohio Crankshaft Co. 26
Oronite Chemical Co. 28

Pacific Gas Corp. 13
Payne Furnace Co. 1
Peninsula Utilities Co. 94
Phillips Petroleum Co. —
Pittsburgh Equitable Meter Division Rockwell Manufacturing Co. Front Cover
Tin Meter Division —

Reliance Regulator Corp. Second Cover
Reynolds Gas Regulator Co. 97
Rheem Manufacturing Co. Fraser Division 87
Roberts-Gordon Appliance Corp. 96
George D. Roper Corp. 96

Screwwercs Co. 96
Security Manufacturing Co. 95
Servel, Inc. 70, 71
Sharples Chemicals Inc. 16
Shaw Burner Co., Inc. —
M. B. Skinner Co. —
A. O. Smith Corp. —
Southern Gas & Equipment Co. —
Sprague Meter Co. 61
Stacey Brothers Gas Construction Co. 11

Thermac Co. 3
Titan Valve & Manufacturing Co. —

Union Carbide & Carbon Corp. —
United Petroleum Gas Co. 9
U. S. Pipe & Foundry Co. —
United States Steel 21
Utility Appliance Corp. 69

Vulcan Proofing Co. —

Wailes Dove-Hermiston —
Walworth Co. —
Ward Heater Co. 12
Warren Petroleum Corp. 79
Williams Brothers 90

John Zink Co. 85

GAS

REG. U. S. PATENT OFFICE

Twenty-Third Year of Publication

CCA

Contents for May, 1947

EDITORIAL COMMENT

Thermally Thinking, *by Elliott Taylor* 23
Highlights 27
Technical Trends, *by Guy Corfield* 74
Promotional Notes and Notions, *by Stanley Jenks* 77

FEATURE ARTICLES

Find Out What Your Employees Think of You, *by John W. Stokes* 29
Management Looks Ahead, *by Louis Ruthenburg* 33
World's Longest 2500-Psi Line, *by William G. Jackson* 37
Auxiliary Gas Supply, *by Virgil Jury* 42
Opportunities for Prepared Atmospheres, *by W. A. Darrah* 46
Floating Pipe 50
Distribution System Capacities 51
GAS' Digests 59
New Appliance Sales Pointers 78

DEPARTMENTS

Associations 62
People 80
New Products 82
Catalogs 98
Pipe Line News 85
Sales Slants 94
Current Reading 95

ELLIOTT TAYLOR, Editorial Director
52 Vanderbilt Ave. New York 17, N. Y., MUrray Hill 4-1880

Publication Office

LOS ANGELES 14, California, 1709 West Eighth Street, DRexel 4337.

Branch Offices

DAVID CARMEN, Manager, **CHICAGO 3,** 1064 Peoples Gas Building, WABash 2589

GERARD A. REGAN, Mgr., **NEW YORK 17,** 52 Vanderbilt Ave. MUrray Hill 4-1880

ROBERT B. FARSON, Manager, **DALLAS 1,** 301 Southland Life Building, CEntral 4585

Executive

JAY JENKINS .....President and Publisher
JAMES E. JENKINS.....Secretary-Treasurer

Editorial

BILL CLARK ..... Managing Editor
GUY CORFIELD .....Technical Editor
PAUL LADY .....Assistant Editor
O. D. HALL .....Mid-Continent Editor
FREDERICK L. DALTON .....Art Director

May, 1947. Volume XXIII, Number 5, GAS is published monthly by Jenkins Publications, Inc., 1709 West Eighth Street, Suite 320, Los Angeles 14; California. Subscription price: United States, Canada, Mexico, Cuba, South and Central American countries (in advance), 25 cents the copy; $2.00 per year. All other countries, $3.00 per year. Acceptance under the Act of June 5, 1934 was authorized February 26, 1946. Member: The Controlled Circulation Audit, Inc. Publishers: BUTANE-PROPANE NEWS; Handbook BUTANE-PROPANE GASES; BOTTLED GAS MANUAL, WESTERN METALS.

Thermally Thinking

By ELLIOTT TAYLOR

Utopia Unlimited

AN ancient and honorable exaggeration, piously reaffirmed at practically every convention ever held by any industry anywhere, attests to the fact that this year, of all years, the industry is on the very threshold of progress and profits hitherto undreamed of, that its practitioners are even now entering onto the broad highway of breathless advancement and that ahead of them unfolds a panorama of eminence and achievement such as would have staggered the timid imaginations of yesteryear's outmoded minds.

Merely to reiterate that statement here as an effortless tribute to the annual deliberations of the Natural Gas Department of the American Gas Association would be at once lacking in novelty and devoid of even passing significance. Yet such has been the march of events during the past two years, and more particularly within the last few months, that to make any less optimistic a pronouncement in respect to the opportunities immediately ahead for the natural gas industry would amount to little less than a deliberate depreciation of its prospects.

Fundamentally the future of natural gas turns on the answers to some simple basic questions. Is there enough gas available and in sight to encourage large expansion operations? Is the political temper of the times such as to permit this expansion? Is there a market waiting to be served, and capable of absorbing fuel in quantities and on overall delivery schedules that would justify the necessary long distance transmission facilities? Is finance capital interested in the investment opportunities that this whole pattern of industry expansion would open up? Each question is in a measure related to all others and an affirmative answer to every query is essential to the affirmation of any one. Without reserves, the market might or might not want gas—it would make no difference. In a prevailing political atmosphere of local and national hostility to expansion, gas in the ground would have little chance of reaching the markets in quantities and at rates that would establish it as a predominant industrial, commercial, and domestic fuel. If the outlook for the industry did not appeal with dramatic possibilities of profit to financiers and the investing public, then capital structures required to extend overland transmission systems into new markets could never be put together.

But when every single one of the crucial questions can be answered in an unequivocal affirmative, as at this particular moment all of them can, the aura of optimism, traditional with all gas conventions becomes, in this instance, a part of the fabric of tangible fact.

Reserves are more than adequate. They are in fact unfathomable. Every annual estimate of the volume of natural gas still locked in the ground exceeds that of all previous surveys on the subject. At the end of 1946 the joint committee on reserves of the American Petroleum Institute and the American Gas Association estimated the proven gas reserves at 160.6 trillion cu. ft. This is an increase of 12.8 trillion over the figure for Dec. 31, 1945. To this may be added the 4.9 trillion cu. ft. of estimated net production for 1946.

The growth of gas reserves despite ever-accelerating withdrawals is of great significance. Those who would limit the expansion of gas systems to gain their own economic ends have buttressed their case in a large measure on the dwindling aspect of our irreplaceable natural resources. Now, not only are their professional fears proven groundless, but they are faced with the counter question—can anything that exists in a finite quantity be regarded as dwindling so long as by all known standards of measurement it is in an ever increasing, obtainable supply? While few would go so far as to state that natural gas reserves are literally inexhaustible, it is true that a growing body of opinion has come to believe that natural gas, like coal, is already known to exist in quantities that may well project it into the very shadow of some future obsolescence.

A new concept of conservation has already replaced the old theory, political in its origin, that by hoarding gas in the ground, at the expense of royalty owners and producers, some new regional advantage might be gained in the remote and unprobed future. Underground gasification of coal and the possible development of atomic energy on a commercial scale are both laboratory subjects that may presently burgeon forth with unpredictable effect on all fuel economics. There is also the pull of distant markets and the demand for natural gas at prices well able to insure profitable transmission from almost any field to any consuming area. This demand has been strengthened by the added impetus of producers at home who want to realize on their reserves in their own lifetime, and while their gas is still a salable commodity.

Political considerations as they affect the industry as a whole remain a potent and, in a measure, an unpredictable factor. But even in this dark and sometimes baffling labyrinth there can be discerned broad guiding streaks of the light of economic realism.

Politicians Decline

In the realm of Federal Power Commission jurisdiction, long the most hotly contested field of politcal control, there has developed in the past year, and particularly since the close of the Natural Gas Investigation, an appreciable measure of accord between the industry and the federal regulators. No one who followed closely the whole of the

Docket G-580 proceedings could overlook the fact that their tenor was marked by a gradual change in attitude on the part of the commissioners, their staff and their counsel toward the natural gas industry. We believe that the investigation proved to be educational in more ways than were perhaps originally intended by the commission, and it was an educational process out of which gas men learned much that had eluded them in practical application if not in abstract knowledge. Measures proposed by the industry, whereby the FPC might simplify and speed up certificate procedures, were adopted by the commission even before the evidence coming out of the hearings had been completely analyzed by the staff. In the matter of its jurisdiction over production and end use, the commission, in a section of its staff report on the natural gas investigation, repudiated, albeit guardedly and with some reservations, jurisdiction over these two functions of industry operation.

Congressional action, via the Rizley Bill, to delimit and precisely define FPC authority under the Natural Gas Act is a future possibility, although hardly an immediate probability. But to politically alert federal appointees of any stamp, the trend of Congressional thinking is always significant. With this or a similar bill pending, it is safe to assume that the FPC will, for now, walk with circumspection and caution within the precise boundaries of the Natural Gas Act as it reads.

Markets Beckon

The market demand for natural gas has become so universal that to single out any one area as being aggressively bidding for that fuel supply would be to neglect a dozen other equally vociferous claimants. Since becoming the successful bidders for the Big and Little Inch government lines, Texas Eastern Transmission Corp. has been beseiged with inquiries from manufactured gas utilities in the Atlantic seaboard and New England areas regarding possible service. When the new corporation takes over the lines May 1 it will have a larger market demand than the pipes will be able to supply. While FPC has authorized the company to add compressor stations to bring the lines up to 250 MMcf per day, in the Appalachian area which it serves, deficiencies totalled as high as 500 MMcf per day during the past winter. Introduction of Texas gas into the East on a permanent basis, which is what the sale of the Big Inch lines to gas bidders inevitably portends, means that other lines and still greater capacities will be projected, built and operated within the near future. The opposition of the railroads, of a few coal producing states such as Pennsylvania, and of the coal industry itself is no longer a formidable barrier to natural gas extension. The gas consuming market has now become so natural-gas conscious, the public and industrial demand has become so insistent and the need for new gas supplies so critical that no power short of a dictator's edict could alter the established trend to natural gas.

Money Waits

That financial backing is available for natural gas expansion has been amply evidenced by the magnitude of the expenditures envisioned by all of the bidders on the government owned lines, and by the evidence that they presented of satisfactory arrangements for financing operations under the terms of their respective bids. While financiers diligently foster the belief that sound economic analysis is the only reliable yardstick with which to measure a potential investment, they know too that the emotional appeal of any project that has captured the public interest and imagination is a potent factor in influencing sales of securities to general investors.

Plans, Best Laid

THE gas industry is afflicted with plans the way some people are bothered with mice. They are all over the place, and while they never do any great amount of harm they are inclined to be distracting and at times even a little wasteful of human effort and energy. It seems almost unkind to bring the matter up at this time, but what became of all the postwar planning that had industry members chewing lead pencils and gazing ingenue-eyed at blown up charts complete with lights and bells and buzzers showing what a hell's-own scramble they would have, for instance, to hang onto the heating load?

Manufacturers of appliances and equipment went to great lengths to prepare and distribute minutely detailed plans for a step-by-step advance on the embattled consumer as soon as he had polished off his share of the war against Germans and Japs. Whole carloads of gas industry salesmen, often joined by their travel-hungry bosses, went about from city to city explaining plans, drumming home slogans, whipping up the old fighting spirit to overcome hypothetical problems that never materialized. Of course, it is explained now, when these plans were made no one foresaw the shortages that would continue, and seem destined to continue for years, after the war's termination. Yet planning rests its case, justifies its very existence, on the planners' ability to foresee the future.

We do not decry intelligent planning as such. But we do believe that in many instances, to which the gas industry is no exception, planning has been allowed to take the place of principles, and many who would otherwise have thought things out for themselves have relaxed into easy reliance on the fallacy that all of the answers could be looked up, right in the back of the book.

Principles rather than plans have been the keystone in the arch of every industry's progress. It was, and is, the principle of devotion to the public service that has brought the gas industry along to where it is today. It is principles, often as not unwritten and never voiced, that have carried it through every crisis in its history. Plans, even those that are gravely extolled as being so long range that they encompass all of the foreseeable future, are at best makeshift expedients, workable only in those rare instances when the planners themselves have fortuitously foreseen the future with some slight degree of accuracy.

For our part, we are as well satisfied that many of the plans didn't work out as anticipated. If every one of us had bought all of the services, and all of the merchandise that postwar planning would have shoved down our throats and into our homes, life would have been too cluttered for any sane and comfortable existence. And planning would have so robbed it of uncertainty as to render the remaining years of our existence completely bare of the zest that only uncertainty can bring to our humdrum mundane plodding.

The very paradox of unlimited availability and actual waste in the producing areas, compared to a clamorous unsatisfied demand for more gas in the populous consuming centers, creates a vivid picture of profit to be made in linking these two extremes—a picture that any investor may be expected to view with avid and avaricious interest.

Thus it is apparent, even in the light of a perfunctory appraisal of its position, that as of this first of May, in the year 1947, there is discernible no single valid reason to doubt that the natural gas industry is indeed on the threshold of the most fabulous decade of progress in all gas history.

Highlights

● The FPC is considering two applications from the Southern Natural Gas Co., Birmingham, Ala., which if approved would extend natural gas service to Northern Florida, Southern Georgia, and South Carolina, and would cost an estimated $50 million. Docket G-796 seeks authority to increase its capacity from 255 to 490 MMcf per day, and supersedes a previous request for an increase to 205 MMcf. In addition to supplying increased demands in the territory now served, the company contemplates construction of 375 miles of 24-in. line from the Gwinville Field, Mississippi, to Atlanta, Ga. Docket G-884 would authorize a 225-mile, 16-in. trunk line extending from the proposed Gwinville-Atlanta line to Colfax, Ga.; thence 155 miles of line to Tallahassee, Fla.; 165 miles to Jacksonville, Fla., 54 miles to Savannah, Ga.; and 182 miles to Georgetown, S. C. From Jacksonville, it was reported that United Gas Corp., Shreveport, La., was also considering bringing gas into Savannah, Jacksonville, and Charleston, S. C. United Gas was checking the feasibility of using the Carrabelle-Jackson oil line, a war-built pipe formerly used to carry oil to the coastal cities, which was due to go on the WAA block in April.

● The 29th annual convention of the American Gas Association will be held in Cleveland, Oct. 6-8, instead of in San Francisco, Sept. 30. Shortage of hotel accommodations in the latter city was blamed for the move.

● The Federal Power Commission and the anti-trust laws were listed as deterrents to reduction of flaring of casinghead gas in Texas during the first few days of hearings opened by the Railroad Commission of that state April 8. Rex G. Baker, general counsel for the Humble Oil and Refining Co., Houston, declared that on the one hand operators fear that by selling casinghead gas to a gas distributor they will be declared in effect gas companies themselves and all their operations will thus be subject to FPC regulations; that on the other hand they see a threat of prosecution for violation of anti-trust laws if they join forces to devise facilities for utilization of the flared gas. Former State Senator Clint Small told the commission that other producers felt the same way about the possible anti-trust law violations. Meanwhile, operators in the Seeligson field were still pumping oil after obtaining an injunction blocking the commission's earlier order to shut down or quit flaring gas.

● The FPC extended to Oct. 1 the temporary authorization of Northern Natural Gas Co. to sell natural gas to Northern States Power Co. for resale in St. Paul, South St. Paul, West St. Paul, and Rosetown, Minn. The permit was due to expire April 1, having been granted as a wartime emergency measure.

● The Texas state senate has approved a bill allowing sweet gas to be used in the manufacture of carbon black. As it stands, the bill specifies that five pounds of furnace black must be produced from every Mcf of gas.

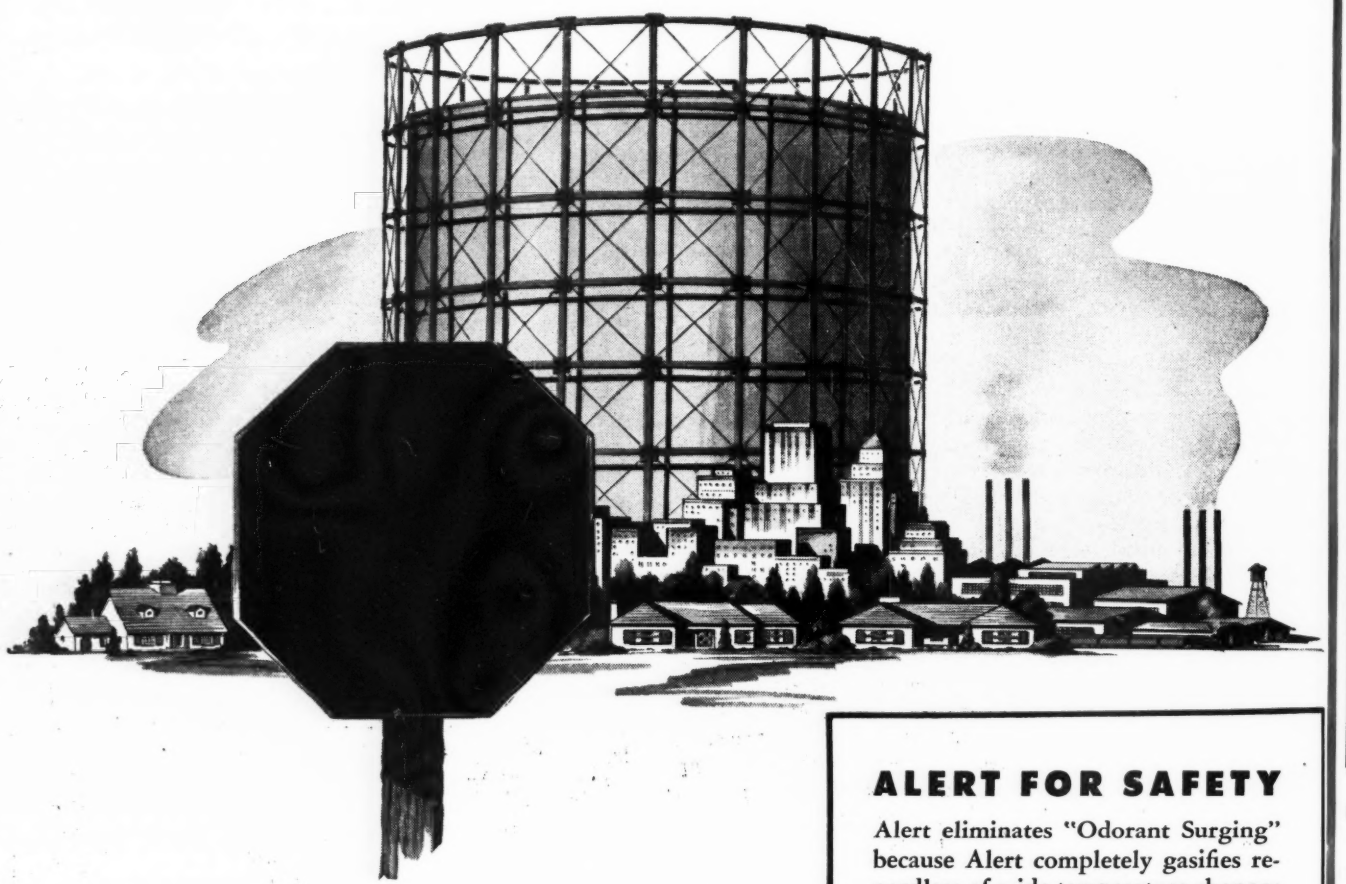
● The Federal Power Commission has authorized Tennessee Gas and Transmission Co. to divert 1.5 MMcf of Big Inch gas per day from Carnegie Natural Gas Co. to Columbia Gas and Electric Corp. to aid in alleviating a gas shortage resulting from low temperatures and high winds prevailing in the Appalachian area. The authorization will remain in effect until the Commission takes further action.

On March 7, following recommendations of the Industry Advisory Committee, the FPC allocated deliveries of natural gas from the Big Inch for the period from March 8 to April 30 with the specific provision that the 1.5 MMcf of gas per day allotted to Carnegie Natural should be subject to diversion to such other companies as the Commission may direct on days when severe curtailments were in effect on the systems of the other companies.

● When Texas Eastern Transmission Corp. takes over operation of the Big and Little Inch lines this month, construction will be started on three new compressor stations, aggregating 18,000 hp, which will eventually increase the capacity of the lines to 250 MMcf per day. The program was approved late in March by the FPC, with the stipulation that it be completed by Nov. 1, 1947. Further capacity increases were sought by the company in an application for an additional 24 compressor stations with a horsepower rating of 122,000, which would bring the deliverable to 425 MMcf per day—more than three times present output.

ORONITE
CHEMICALS
Reg. U. S. Pat. Off.

THE NAME TO WATCH IN CHEMICALS



CONCERNING CONCENTRATED ODORANTS:

ALERT means SAFETY

Where equipment and circumstances call for use of a concentrated gas odorant—remember Alert for Safety. We build Alert of selected petroleum mercaptans of both the iso and normal types. They impart that typical "Gassy" odor instantly recognized by gas users.

STABILITY • COMPLETE COMBUSTION • PROPAGATION
the three "musts" for a *safe* warning agent. ALERT combines all three.

Authorized Distributors: Humble Oil & Refining Co., Standard Oil Co. (New Jersey, La., Ark., Tenn.), Standard Oil Co. (Kentucky), Standard Oil Co. (Indiana).

ALERT FOR SAFETY

Alert eliminates "Odorant Surging" because Alert completely gasifies regardless of wide temperature changes—does not condense on valves or in meters or joints.

Shipped in drums containing 375 pounds—*one pound* will normally odorize up to 2 million feet of gas.

TYPICAL TESTS:

Gravity A. P. I.	38.6°
Weight Lbs. per Gallon	6.9
Sulphur	38.8%
Distillation Range (D-86):	
Start	117° F
10%	130
50%	149
90%	208
End Point	280
Recovered	98%
In Flask	1
Loss	1

ALERT... by makers of Calodorant ...the oldest name in gas odorants

1394

ORONITE CHEMICAL COMPANY

200 Bush St., San Francisco 4, Calif • 30 Rockefeller Plaza, New York 20 • Standard Oil Bldg., Los Angeles 15, Calif.

FIND OUT

What Your Employees Think Of You

IN THESE DAYS of increased consciousness of the need of public relations, finding out what other people think is becoming an important job. To accomplish this, we should start at home: what do our own employees think? The oil industry discovered that "those who know you well think well of you." But, even if it be presupposed that this reaction extends to the gas industry, it is germane to ask: Just how well?

Mr. Stokes can't answer that question, but he does provide an instrument for answering it. The two pages following contain a sample questionnaire drawn up by this expert, which can be tailored to the individual gas company's requirements.

TO move in any direction we must start from where we are. If we are to bring about improved human relations — better teamwork — increased productivity—in the gas industry, the first step is to find out what present

Exclusive

employee attitudes are. How do workers feel about their jobs? What do they think of company policies? What are their attitudes toward management?

One of the best ways to find this out is through personal interviews, as has been done so notably by such companies as Western Electric Co.; but this is a costly and time-consuming process. Above all, it requires skilled and thoroughly trained interviewers.

A more direct and simpler method is the employee opinion survey which has been used successfully by many industrial concerns.

Under this plan employees are asked to fill out questionnaires giving their opinions on such matters as wages, hours, working conditions, opportunities for promotion, fellow workers, supervision, management and company policies. Every effort is made to bring out frank expression on the part of the worker.

Obviously the purpose of such a survey is to bring to light conditions that need correction. But there are other by-products which will help build good human relations. To ask an employee's opinion gives him recognition, and most workers crave recognition. It indicates management's interest in him as a human being. Furthermore, the answers to the questions, when summarized, can be put to practical use in training foremen, supervisors, and executives in new and better ways of bringing about teamwork.

Judging from the writer's own experience of many years in the gas business, there would seem to be no reason why the employee opinion survey cannot be as useful to a gas company as it has been to other businesses. The petroleum industry, for example, has found it an eye-opener.

Some gas company managers may feel that they already know just what the attitudes of their employees are. Some may not want to know and there may be a few, despite the lessons of the past decade, who just don't care. Then too, there are always those cautious souls who, like the proverbial ostrich with its head in the sand, are fearful of stirring things up by asking questions.

Frankly, no progressive gas company manager should consider conducting an employee attitude poll unless he is willing to face some critical comments. By all means, he must be willing to remedy any unwholesome conditions which the survey may bring to light, but no manager who is trying to do a sincere and conscientious job should have any fears about what his employees think about it.

Actually, the results of employee opinion surveys thus far have been reassuring. For example, companies in the oil industry, which made a widespread public opinion survey recently, found that their own employees gave them a higher rating in many respects than did other sections of the general public.

Progressive gas company executives will surely agree that it is better to find the points of friction before they become sore spots. Money spent in prevention will total less than the costs of the cure.

FIRST of all, the survey must be intelligently planned in accordance with the needs of the particular company. What do you want to find out? To which employees is the questionnaire to go? Will you include the men in the plant, the maintenance and repair crews, the meter-readers, collectors, salesmen, the office force? The answers to these queries will determine the way in which the questionnaire is to be framed.

Here is where you can get the cooperation of your foremen, supervisors, and executives right at the start. Explain the plan to them. Get their suggestions and ideas as to which questions should or should not be included. With their interest and backing the survey is off to a good start.

The actual wording of the questions is extremely important. They should be worded in simple, understandable

By JOHN W. STOKES
Stokes, Boynton & Co, Boston

Sample Questionnaire

This questionnaire is filled out by a..... Man_____ Woman_____

1. How long have you worked for the gas company? _____years_____months

2. Are you married? _____Yes_____No. How many children?_____

3. What other members of your family, besides yourself, are regularly employed?.....

4. How do you feel about your present job?
   _____Like it
   _____All right for present
   _____Don't like it
   Give reasons for your answer.....

5. Do you think opportunities with the gas company are better than with your last employer?
   _____Yes
   _____No
   _____About the same
   (a) If your answer is "No," please explain why

6. Compared with what you might earn elsewhere at the same sort of work, do you think your earnings are.....
   _____Good
   _____About Average
   _____Low

7. Do you feel that your wages are in line with rates of pay for similar work elsewhere in this community?.....Yes _____No

8. What do you think of working conditions here as compared with other companies?.....
   _____Good
   _____Average
   _____Poor

9. In your opinion is everything being done to provide for safety?.....Yes_____No
   If your answer is "No" please tell what you think could be done.....

10. Do you find your fellow workers:
    _____Friendly
    _____Indifferent
    _____Unfriendly

11. Do you think morale in the company is:
    _____Better than most plants
    _____Average
    _____Not so good
    Give, if you wish, the reasons for your opinion

12. (a) Check the descriptions that best fit your:

	Foreman	Supervisor
Fair at all times	_____	_____
Fair most of the time	_____	_____
Seldom fair	_____	_____
Never fair	_____	_____

    (b) How would you rate him on these points?

Knows his stuff	_____	_____
Gets by	_____	_____
Workers know more than he does	_____	_____
Sets a good example	_____	_____
Does not set a good example	_____	_____

13. A woman customer complained that her bills were too high. When an inspector saw the instantaneous gas water heater in the home, he said, "No wonder your bills are high. That thing just eats up gas!" What do you think of his statement?.....

14. Do you feel that in this company you are recognized as a "human being," and treated with dignity and respect?.....Yes _____No

15. Have you ever had occasion to discuss a problem with the personnel supervisor?
    _____Yes _____No
    Has he been helpful to you?
    _____Yes _____No

16. Do you think promotions in the company are based on "pull"?
    _____Not many
    _____Quite a few
    _____Too many

17. Do you like your present working hours? .....
    _____Yes _____No
    If your answer is "No" what hours would you prefer? .....

18. Do you think you could turn out more or better work than you are now doing?.....
    _____Yes _____No

What Employees Think of You

Remarks: .....

19. Do you enjoy associating with your fellow workers after working hours?_____Yes _____No

20. How do you think your company management, in general, compares with that of other companies?
_____Above average
_____About the same
_____Below average

21. If you have taken company training courses, have you found them:
_____Helpful
_____Not particularly helpful

22. Our last Annual Report showed that each dollar of available company income in 1946 was divided as follows:
Paid to employees..... cents
Reinvested in the business..... cents
Dividends to stockholders..... cents
Do you think this was a fair distribution?.....
_____Yes _____No

23. (a) Do you read the (company house organ)?
_____Occasionally
_____Regularly
_____Never

(b) In what material or departments in (house organ) are you chiefly interested?.....

.....

(c) Please check by number 1-2-3-4, etc. in the order of interest these subjects hold for you)
_____Company business information
_____News of fellow employees
_____Personals
_____Editorials
_____Sports

(d) If you were editor of the (house organ) what changes, if any, would you make in the paper? .....

.....

.....

.....

24. Do you like our Handbook for Employees?.....
_____Yes _____No
Give suggestions, which, in your opinion, would make it more useful to you on the job.....

.....

.....

.....

25. Do you read company bulletins?
_____Regularly
_____Sometimes
_____Never
Are the company bulletins easily understood?.....
_____Yes _____No
Are bulletins properly displayed?.....
_____Yes _____No

26. Do you take part in company sponsored athletic or social activities?....._____Yes _____No
Any suggestions for improving this program?....

.....

.....

27. Do you regard the food served in the cafeteria as:
_____Generally good
_____Good most of the time
_____Satisfactory
_____Unsatisfactory
As compared with eating places elsewhere, do you think the prices charged are: _____Reasonable
_____Excessive

28. Do you own, or are you buying, your own home?
_____Yes _____No

29. Do you have cash savings other than War Bonds?
_____Yes _____No

30. Do you expect to buy:
A new home....._____Yes _____No
A new automobile....._____Yes _____No
A used automobile....._____Yes _____No
Furniture ....._____Yes _____No
A refrigerator....._____Yes _____No
A washing machine....._____Yes _____No
A vacuum cleaner....._____Yes _____No
A radio....._____Yes _____No
A kitchen stove....._____Yes _____No
Anything else?.....

.....

.....

31. Do you feel you have a real future with this company?....._____Yes _____No
Why? .....

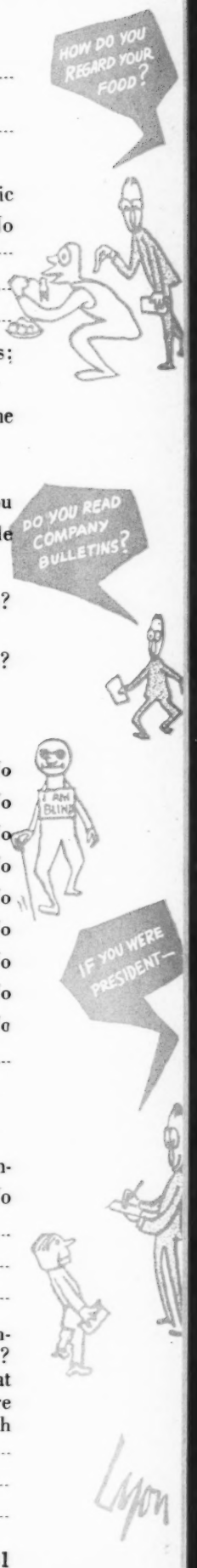
.....

.....

32. What do you think the company should reasonably do for employees which it is not now doing? If you were president of the company, what changes would you consider to make it a more productive and more satisfactory place in which to work? .....

.....

.....



language. More than that, they should be so framed as to evoke, as far as possible, a frank answer, unbiased by the form of question.

For example, if you ask, "Do you feel that your foreman is fair or unfair?" it is obvious that there is only one answer, either "yes" or "no." On the other hand, you might ask "How do you feel about your foreman?" The answers would, of course, vary; some might be lengthy. By using the so-called multiple-choice question, the query would be framed as follows:

"How do you feel about your foreman? Is he

Fair at all times.....
Generally fair.....
Seldom fair.....
Never fair.....

(Check the answer that best fits him)"

On the other hand, if you were asking about your employee handbook, you might ask.

"Do you like the company handbook?

Yes..... No.....

Give any suggestions you may have for its improvement

.....
....."

If you ask, "Do you consider your wages adequate or inadequate?" probably most would answer "inadequate." On such topics comparative questions can be used as: "How do your present wages compare with those earned on your last job?"

The format of the questionnaire is also important. A well-printed folder, liberally sprinkled with sketches of the cartoon type and with splashes of color, will evoke more interest and response than a drab mimeographed job. What is worth doing is worth doing well. A touch of humor will help.

Best results come when the questionnaires are mailed to the employee's home. This allows him the opportunity of writing in the answers unhurriedly. The employee can thus look at his job more objectively. It is wise to set a definite return date and to enclose a post-paid return envelope.

In order to ensure frank replies, it is well to insist that the questionnaire *not* be signed by the employee. Thompson Products Co. of Cleveland, which has done an outstanding job in this field, arranged with the staff of a local college to receive and collate the answers to their questionnaires. This additional assurance of impartiality, while perhaps not absolutely necessary, was most effective.

WHEN the returns have been analyzed and tabulated they are then available for study. A committee of executives representing the various departments should be appointed to study the results and to take steps to correct any bad conditions which can be immediately rectified. Suggestions for improvements can also be discussed by this group and appropriate action can be taken.

It will be found, however, that many of the answers indicate the need for changes in policies and in the attitudes of foremen, supervisors and even executives themselves. These answers should be carefully collated and arranged so as to form the bases for discussions at meetings of foremen, supervisors and executives. In these discussions, frankness should be encouraged.

Some of the criticisms sent in on the questionnaires, especially those of a small minority, may seem unreasonable. They represent the views of the chronic grouch. As a rule, these comprise only about 1% of the total answers and they cannot be handled to advantage by the discussion group. If the proportion of such responses is high, it is a good indication that the services of a skilled interviewer are needed. Interviewing helps to draw out such abnormal people and aids them to resolve the inner mental conflicts—which are the true cause of their gripes, rather than the external things of which they complain. It is well, however, to have the tabulation handled by someone competent to spot such answers, and who realizes that answers to questionnaires must be relatively evaluated.

One of the advantages of the questionnaire method is that periodic surveys may be made and trends established based upon a comparison of results. These trends may be of great significance in measuring the progress of a human relations program in a gas company.

The LeTourneau Co. at its Toccoa, Ga., plant, issues employee opinion polls periodically and finds them of value in indicating trends.

The table is a sample questionnaire to be used by a gas company. It would be accompanied by a carefully worded letter from the president or chief executive explaining the purpose of the survey, asking for the employee's hearty cooperation, and telling when and how the answers are to be returned.

You may want to announce that a summary of the results will be published and sent to all employees. This may seem like "sticking your neck out," but it assures everyone of your sincerity in the matter. Furthermore, it will encourage maximum participation by workers. Knowing the gas industry as we think we do, we are confident that you will have a report to send out that will also aid in building good will, another valuable by-product of the employee opinion survey.

Many other questions could be introduced and some of the ones in the questionnaire replaced. These samples, which are adapted from actual questions used in employee opinion polls in other companies, are listed to give a concrete idea of how a questionnaire may be worded.

By all means, if you decide to use the questionnaire method, let it be adapted to the particular needs of your company. Best results will come if it is carefully discussed and worked out by a representative committee of your own executives and supervisors.

ABOUT THE AUTHOR

JOHN W. Stokes got his early training with the Public Service Gas & Electric Co. in New Jersey, going through the various jobs in the Commercial Department from reading meters to selling gas appliances, so that he knows the industry at first hand.

For a number of years he was associated with the United States Chamber of Commerce as Southeastern field manager with headquarters in Atlanta, Ga. He later became a vice president of Ellery A. Baker & Co. of New York, an industrial engineering concern. In this capacity he aided in the operations of many large industrial and merchandising companies in various parts of the country. In 1942 Mr. Stokes opened his own business as a management consultant in Boston.

Mr. Stokes has written many articles in trade journals on human relations in industry and spoken from coast to coast on the problems incident to increasing productivity in industry.

His address last spring before the New England Gas Association on "Getting People to Work Together in the Gas Industry" attracted widespread comment.

Mr. Stokes studied at the University of Minnesota and graduated from MacAlester College. He has also taken graduate work at Boston University, where he is a part-time instructor in the Graduate School of Business Administration.

Management Looks Ahead

Industrial management is a trusteeship, holding in trust the interests of consumers, employees, investors. Maintaining a balance among these interests is its responsibility.

By LOUIS RUTHENBURG
President, Servel, Inc.

THAT the people of the United States have achieved the world's highest and most widely distributed material living standard is a statement of obvious fact. Almost equally obvious is the fact that our high material living standard is the direct reflection of a degree of productive efficiency not heretofore or elsewhere attained.

These conditions are not accidental. Neither are they traceable solely to our wealth of natural resources or to unassisted providence. A well-defined evolutionary pattern is clearly apparent as we examine the philosophy upon which the republic was founded and as we review the industrial history of the United States, which grew out of that philosophical background.

The republic developed from a philosophy which contemplated maximum individual freedom from restrictive influences. The environment and incentives which were engendered and maintained under that freedom brought about the most highly productive cooperation among the various elements in our social and economic structure. An ingenious, energetic, free people developed a remarkable but essentially simple economic formula, under which productive efficiency increased rapidly.

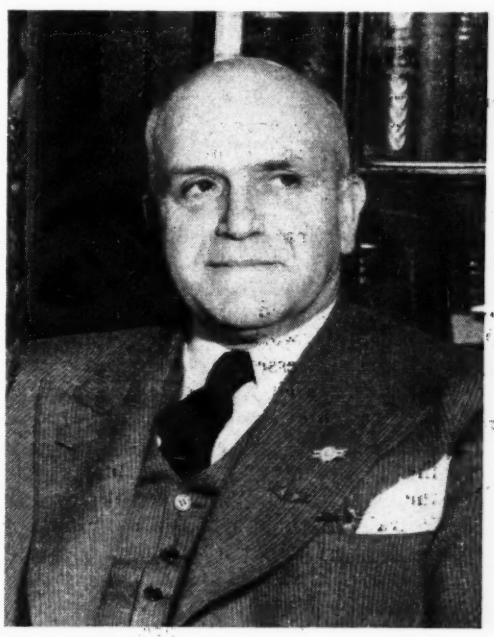
The summary in *Table 1*, which covers a 90-year period, is interesting and significant.

American inventive talent, untrammeled and stimulated by compelling incentives, developed an ever-increasing wealth of new and desirable products and constantly improved techniques of production. The limited physical power of human beings was augmented and multiplied by mechanical power. Surpluses, or profits, made possible greatly increased investments in the tools and facilities of production. Management combined these tools and facilities with effectively organized and supervised groups of men and women to attain maximum effectiveness in production.

Changing Trend

Many economic trends which we had come to regard as normal were interrupted by the depression which began in 1929, and by World War II. Vast political, social, economic, scientific and technological changes have taken place during the confused years that followed 1929. Complex interrelationships among these forces must be taken into account, and yet haphazard political policies have raised new obstacles —obstacles which seem likely to prevent consistently improved productivity in the future.

Increased productivity results from cooperative action of innovators, investors, technicians, consumers, workers and management. Each responds to certain incentives. Each fails to cooperate in the absence of such incentives.



In this republic each has the right and power to promote or obstruct the processes through which improved productivity may be attained.

I shall not discuss changes that have taken place in the status of the several groups. My comments are limited to certain management-worker relationships, for these changes comprise a separate subject in themselves.

TECHNOLOGICAL improvement of processing is an obvious and important element in increasing productivity, as is the steady increase in tools and machinery. But neither can be fully effective without the voluntary cooperation of workers.

In certain areas of activity, productivity has for many years been restricted by lack of worker cooperation. For example, the limitations which have been placed upon output by the building trades and by "featherbedding" practices of railway workers are quite generally understood. It is an unfortunate fact that similar restrictive practices during recent years have spread over greatly increased areas of the American economy. Thus, the motor car industry, which for many years had established new high standards of productive efficiency through continuous innovation and greatly increased investment in improved facilities of production, now suffers under the blight of reduced productive effort on the part of labor. Most of you are familiar with the statement of Henry Ford II that productivity in his plants had declined 34% since 1941.

A few labor leaders are aware that the ultimate welfare of their constituents is dependent upon increased productive efficiency, but so far the effects of their exhortations have been negligible. Nonetheless, the emphasis that men like Dubinsky, Green, Lewis and Murray have placed upon the importance of productivity is distinctly encouraging. Labor leaders and management face the joint responsibility of carrying forward a great, sustained educational effort which will convince all Americans that we can divide only what we produce; that the welfare of workers, consumers and investors alike is dependent upon increased productive efficiency; and that the living standard must inevitably decline in consequence of reduced productive efficiency. All of us must learn to distinguish clearly between the *meaningless money wage* and the *truly significant real wage*, which takes into account the amount of goods that the money wage will buy.

TABLE 1. INVESTMENT—HORSEPOWER—WAGE RATIOS

Year	*Investment Per Plant*	*Investment Per Worker*	*Horsepower Per Worker*	*Annual Wages Per Worker*
1849	$ 4,000	$ 500	Very little	$ 248
1879	10,000	1,000	1.3	346
1909	70,000	3,000	2.9	510
1939	270,000	6,000	6.4	1,150

While annual wages increased more than 4½ times, hours worked per week were reduced about 40%.

Increased Mechanization

Among the compelling pressures that now stimulate management to increased mechanization and technological improvement in the processes of production are fantastic increases of money wages, the abandonment or reduced effectiveness of incentive wages, the intransigence of many labor groups, and an abundant supply of cheap money. Process engineers, tool designers, and tool makers, are now and will be in demand as never before. Invention and innovation will be at a premium without precedent.

The files of American industry already contain many plans and specifications for improved processing. Many of these were not economically feasible in the prewar years because the resulting savings, calculated in terms of reduced productive labors costs, were not sufficient to justify the investment. As between 1939 and July, 1946, average industrial hourly wage rates increased more than 72% [1] while output per man-hour in many industries has decreased. When both wage increases and decline of productive efficiency are taken into account, many investments in labor-saving equipment which were unattractive in the prewar period now assume very inviting aspects, notwithstanding increased equipment costs. The availability of money at low cost tends to offset increased capital requirements.

In 1939 we used 6.4 hp per worker, thereby placing at the average workman's disposal more than 50 times the power of his own muscles. If we assume that average industrial wages are $1 per man-hour in this country, today's cost of mechanical horsepower is in the order of 1/800 of the cost of human muscle-power. Industry buys mechanical power at rates substantially less than one cent per horsepower hour, and one man's muscle-power is equivalent to ⅛ horsepower.

Man's muscular power is so costly, that, even were Chinese coolie wages involved, we could not afford its purchase. We need man's directive ability to control the use of maximum mechanical power to the end that his productivity and real wages may continue to rise.

Again the voice of the technocrat will be heard, and we must face the fact that definite hazards are involved in greatly accelerated mechanization of industrial processes. Dislocations, maladjustments and unemployment may develop, raising new problems in labor, social and political relationships. The already apparent trend toward concentration of capital and industrial operations may be greatly accelerated at the expense of small business.

Recent increases in money wages and the pervasiveness of restrictive labor practices, together with deliberate discouragement of profits, are abnormal phenomena which will have abnormal repercussions. We cannot eat more than we produce. We cannot reduce the planting of seed corn and still have larger harvests to eat.

Scarcity of Skill

As we consider the demand that is being placed upon our technicians and skilled workers to improve production processes, it should be noted that the scarcity of skilled craftsmen presents an extremely serious problem. The Apprentice Training Service of the Department of Labor estimates that there are only 200,000 apprentices now in training (half of them in the building trades). An authoritative estimate indicates that, in order to maintain *the 1940 level* of 5,400,000 skilled craftsmen, 619,000 apprentices must be kept in training continuously year after year. Few apprentices have entered training during the depression and war years. High wage levels, insistent demand for unskilled workers, and reduced differentials between the earnings of unskilled workers and of those in the skilled trades tend to eliminate incentives for learning trade skills. In July 1946, average hourly earnings of all male production workers in 25 manufacturing industries were $1.264 per hour whereas skilled workers and semiskilled workers earned $1.327.[2] An increase in the order of 4½% is not a compelling incentive for entering apprentice training.

If this very difficult problem is not quickly solved, disastrous results may be expected. *It should have the immediate, effective attention of the most capable men in all branches of industry.*

Management a Trusteeship

The technical and economic aspects of productivity and manufacturing methods, vitally important as they are, must, in the final analysis, be recognized as resultants of human equations. I have said that man's mere muscular power is so costly that we cannot afford its purchase. But for his brain-power and heart-power and cooperative effort, price ceilings do not exist. Thoughtful management will concentrate increasing attention upon the art of dealing constructively with the several human groups and individuals whose interests it must serve if satisfactory productivity is to be achieved and maintained.

Modern business management is a trusteeship. It holds in trust the interests of three principal groups—consumers, employees and investors.

Failure to serve the interests of any one of these groups will result finally in injury to the others.

A very delicate balance is involved among these interests. Disturbance of that balance may endanger the entire economic structure. As Dr. Leo Wolman has said, "In this country we operate on an economic system that is a complex, sensitive and subtle system. It isn't easy to destroy, luckily, but it's easy to throw it out of gear. It's easy to impair its operations by a variety of means."

Each of the three groups—consumers, employees and investors—has the power to disturb the balance and to injure itself and its associated groups.

Now let's take a quick look at each of these groups in turn.

The consumer is the ultimate authority. His money, exchanged for the products and services offered by business, supplies the means of meeting payroll, purchasing materials, meeting all expenses and earning profits (if any).

The consumer demands sound values *according to his own standards of value.* Values are a composite of quality, in the inclusive sense, and price. If quality does not appeal or price is too high, *according to the consumer's own personal standards,* he declines to buy. Failure of the consumer to buy

[1] Preliminary Estimate for July, 1946—U. S. Bureau of Labor Statistics.

[2] National Industrial Conference Board.

can deprive employees of their jobs and can cause investors to lose not only a reasonable return upon investments, but invested principal as well.

Moreover, every one of us is a consumer from the time of our birth until the day of our death. So long as we live under the Constitution of the United States no pressure group can prevail against consumers' ultimate interests because the *whole* always must be greater than any of its *parts.*

The consumer is the ultimate boss.

Since workers are also consumers, they live by working for each other.

Employees are more vulnerable than consumers and investors. The failure of a business may deprive the consumer of its products, but the consumer can find substitutes that will meet his needs.

Failure of a business will deprive investors of income and such capital as they have invested. But investors may have other sources of income. Employees, however, lose their jobs when business fails. Loss of jobs means stoppage of income, and great distress may develop before the employee is re-employed, adjusted to new employment, and again the recipient of satisfactory and stable income. Since the worker is also a consumer, the loss of his job will affect other workers through his inability to buy their products or services.

The employee rightfully demands the highest real wage consistent with steady employment and the value of the service he renders. He knows that total annual income is much more important than the hourly rate, because his total annual income determines his real wages, and wage rates mean nothing until hours of actual work turn them into annual income. He wants good supervision, pleasant working conditions, and recognition as a human being who amounts to something in the enterprise. However, if, under misguided leadership, he demands a wage that results in prices too high for consumer acceptance or that results in depriving investors of proper safeguards to their investment or of a satisfactory return thereon, he disturbs the balance and may deprive himself of employment.

Modern management strives diligently to pay employees the highest wage consistent with the requirements of labor's boss, the consumer, and labor's partner, the investor.

The investor eats at the last table. After all wages and salaries have been paid; after all bills for material have been paid; after all taxes and other expenses have been taken into account, the investor may receive some return upon his investment if anything remains.

The investor requires two things to induce him to risk his money to purchase the tools of enterprise. These are (1) safety of his investment, and (2) a reasonable return upon his investment. If either of these reasonable requirements are not to be had, he is naturally unwilling to invest, and that decision deprives the worker of tools and the consumer of goods and services. The result is reduced employment and lowered standards of living.

During recent years organized labor has occupied the limelight and built up its power, at the expense of consumers and investors. For that reason many of us have forgotten that the right and power to exert economic pressure by refusing to cooperate does not belong exclusively to labor.

The economic machine can be stalled just as effectively by labor's boss—the consumer—as by labor. Have we forgotten the "buyers' strike" of 1920, when thousands of Americans wore overalls to emphasize their unwillingness to pay inflated prices? Does no one remember the serious unemployment that followed our postwar inflation only 26 years ago?

Labor's partner—the investor—has the same right and power to strike and thereby to impede economic progress.

Business enterprises caught between the upper millstone of suppressed prices and the lower millstone of rising costs cannot long continue to retain the support of investors, and when adequate financial support is withdrawn management can no longer contribute to the consumer's need for goods and services nor furnish the pay envelope of employees. Management must see to it that each of the groups, consumers, employees and investors, does its fair share in production and is fairly compensated for services performed.

There, simply summarized, are the obligations of modern management and the implications that are involved in those responsibilities with respect to consumers, labor and investors.

For Better Understanding

NOW let's examine some of the things that management may do in order to meet labor's pressing demands without endangering the stability of the business nor betraying the trust of consumers or investors.

Many years ago H. G. Wells characterized civilization as a "race between education and catastrophe." Since those words were written, economic and social complexities have developed so rapidly that the need for mutual understanding and particularly for understanding on the part of management of the viewpoints of consumers, labor, investors and all of the other groups in our complex social structure is greater than ever before.

Management itself must achieve understanding of many things that were not dreamed of in its philosophy a few short years ago. The scene changes so rapidly that we must "run like hell to stay where we are."

Then management must transmit its understanding and philosophy clearly and convincingly to those groups for which it acts in trusteeship, so that the basis of their relationship may be understood and cooperation made effective.

Constructive management always will be conscious of its responsibility to put and keep its own house in order.

Modern management is of itself a complex structure. Understanding within a modern industrial organization cannot be achieved until effective and unobstructed channels and media of communication are established and maintained among all elements of the managerial structure—from top management down through the ranks of those responsible for such functions as personnel admistration, engineering, production, accounting and sales, to every last subordinate in line and staff positions.

Having established such open and effective channels of communication among the elements of management, equally effective means must be found for continuous and harmonious communication with the working forces which perform the functions of the business.

Moreover, these channels must be "two-way passages" because management which is not constantly sensitive to and informed of the changing needs and attitudes of men and women who work at machines and desks and on assembly lines cannot function effectively.

This necessary two-way flow of understanding between management and the people on the payroll cannot be accomplished in the absence of modern and enlightened foremanship. The foreman must represent and interpret each to the other. Since the days of primitive industry, before the coming of scientific management and the more recent ascendency of labor unions, the requirements imposed upon our foremen have expanded prodigiously, and the kind of foremanship that represents a hang-over from the primitive industrial era is wholly inadequate to cope with modern conditions.

In the absence of modern methods of foreman development, management cannot hope to meet its responsibilities to the people on industry's payrolls,

or safeguard the interests of consumers and investors.

Quite obviously, the area in which management is free to manage has been notably restricted, and management will be less free to manage in the future in the degree to which it is affected by growing union influence and increased government control. It is, therefore, urgently incumbent upon management to define, defend and expand that area of influence which will permit it to continue as the responsible trustee for the consumer, the investor and the worker.

Having defined that area, management must permit no encroachment, regardless of the pressures which may be created by current sophistry, shotgun bargaining and collective coercion.

It is particularly important that the area of management which must be allocated to and preserved for the foreman shall be clearly defined and jealously defended. There are far too many establishments in which shop stewards and foremen compete for the loyalty of the workmen. A simple, unchangeable truth is that no man can serve two masters.

Another of these simple truths, often apparent in breach rather than in observance, is that responsibility always must be accompanied by an equal degree of authority, and that authority or power should not be granted without corresponding responsibility for its use.

Above all else in these days we need accurate measurement. The technical progress of industry has been a reflection of our ability to apply increasingly accurate methods of measurement to material things. The art of measuring psychological human dimensions is relatively undeveloped.

There is the vital technique of merit rating for factually recording the comparative performance value of each employee in his assigned work. Merit rating cannot be made to work without clear understanding and close attention from top management, and this is distinctly a management function.

Among modern methods of measurement in a vitally important field is job evaluation. At all costs this measuring stick must be retained as a function of management.

Most of us accept as a matter of fact the desirability of auditing the financial records of our business. In these days is not an audit of our industrial relations equally important?

Top management must acquire greater knowledge and skill with respect to the negotiation of labor agreements. Management must know its objectives and must make every effort to attain those objectives, and to avoid or overcome the many pitfalls and bear traps planted in the areas covered by labor agreement clauses with respect to seniority, wage structure, grievance procedures, arbitration and many other matters that will arise in the course of collective bargaining.

To all of the complexities of management we must bring to bear infinite patience and persistence, consistency and complete sincerity. Modern management has no place for men of doubtful courage.

Notwithstanding current obstacles, productivity probably will increase rapidly as the result of compelling forces which tend to encourage a high degree of mechanization and technological improvement in processing.

Our greatest opportunities for advancing productivity and improving living standards are to be found in the field of human relationships. Having achieved a better understanding of each other and their common responsibility to consumers and investors, both management and labor should do all in their power to convey to the American public comprehension of the simple moral, social and economic principles that underlie our industrial and business relationships.

Very appropriately, the first words that appeared on the printed program for the New England Gas Association conference are these: "Serving the Public Interest." Why shouldn't the public utilities and the manufacturers of America pool their vast experience and facilities and dedicate them to a great national project for public enlightenment? Where else can be found superior tools for doing this vitally important job which must be done if our self-interest is adequately to be served?

Mutual understanding must be achieved as the prerequisite for effective cooperation. "The proper study of mankind is man."

Before the New England Association, Boston, Massachusetts, March 21, 1947.

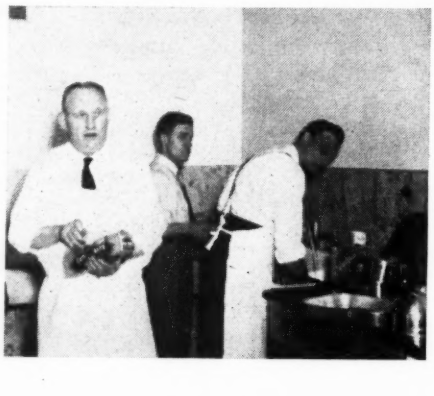
Universal Salesmen Put Through Paces

It might have been just another training course for salesmen . . .

But Cribben & Sexton really "threw the book" at their representatives in a recent week-long meeting in Chicago. A course which took the range from the time it consisted of so much uncoordinated steel to the time when it turned out finished meals was presented as a refresher for older employees and a primary training school for newer men.

Salesmen of the Universal line were subjected to intensive schooling on range design and construction, moved along the assembly line through to the service department, where they learned what the serviceman has to know, learned the good and bad of competitive-fuel ranges and wound up in the kitchen exploring the housewife's domain.

In the newly-completed "Blue Flame Room" each man baked cakes, prepared whole oven meals, and cooked foods on top burners and in broilers. Shown above are three of the men who participated in the preparation of meals: John Sholine of Atlanta; Charles Woodson, Los Angeles, and Robert Erskine, Minneapolis.



Franklin Institute Honors Boyer

"In consideration of his notable improvements in the development of processes for reforming hydrocarbon gases and for his improved and simplified methods for calculating the required composition of interchangeable gas mixtures and for his other valuable contributions to the gas art," Edward G. Boyer, manager of the Philadelphia Electric Co.'s gas department, was awarded the Walton Clark medal of The Franklin Institute at the annual ceremonies in Philadelphia on April 16.

E. G. Boyer

Under Boyer's leadership, the Philadelphia Electric Co.'s gas department has pioneered in developing a process for reforming hydrocarbons, which has resulted in more than doubling the capacity of gas production equipment and has increased efficiency and economy of operation. To meet wartime peak loads, he directed research in his department on mixing gases.

World's Longest 2500-Psi Line [1]

By WILLIAM G. JACKSON[2]
Engineer, Creole Petroleum Corp., Maracaibo, Venezuela

A record-breaking high-pressure gas pipe line was constructed during World War II by the Bureau of Mines, U. S. Department of the Interior, to carry helium at high pressure from the bureau's Navajo Helium Plant at Shiprock, N. Mex., to the nearest standard-gauge railroad terminal at Gallup, N. Mex., 90-odd miles from the plant.

Exclusive

The pipe line is constructed of 2-in. extra-heavy (schedule 80) seamless line pipe, and operates at a pressure of more than 2000 psi. It is an all-welded line, and special precautions were taken to assure its tightness, for the helium being transported is valued at about $15 per Mcf and small leaks, normally insignificant in natural gas pine lines, are important in transporting helium.

Decision to construct the line was made during the building of the Navajo Helium Plant which, because of engineering considerations and critical steel shortages, was located near the helium bearing Rattlesnake gas field near Shiprock. The line was built to get the helium to railhead, and since helium is discharged from the processing plant at a pressure of 2600 psi, the high pressure line permitted filling railroad tank cars to their loading pressure of 2200 psi and avoided the necessity of recompression at the loading terminal, thus effecting a saving in power requirements and materially speeding delivery time.

Seamless pipe was considered necessary as a precaution against leakage, and after considerable searching for steel mills with sufficient unassigned capacity to produce the required pipe, the War Production Board allocated enough 2-in. schedule 80 (2.375 in. O. D., 1.939 in. I.D., 5.02 lb/ft.) seamless-steel, grade B, plain-end pipe for construction of the line.

The contract for the construction of the Navajo Plant, which was let to the Hudson Engineering Corp. of Houston, Texas, was broadened to include construction of the pipe line from Shiprock to Gallup. Under the contract all materials and equipment were selected and purchased by the contractor, although the construction was carried out under the veto supervision of Bureau of Mines engineers. (Hence, any mention herein of materials or equipment by trade name does not constitute an endorsement by the Bureau of Mines.)

Both reconnaissance and the final survey of the selected route were made in the conventional manner. Starting from the Navajo Helium Plant at Shiprock, elevation 5000 ft. above sea level, the route closely follows U. S. Highway 66 across the barren desert land of the Navajo Indian Reservation to Gallup, N. Mex., elevation 6500 ft. Clearing of the right-of-way, pipe stringing, and ditching were performed in accordance with established practices.

[1]Published by permission of the director, Bureau of Mines, U. S. Department of the Interior.

[2]Formerly petroleum engineer, Bureau of Mines.

BORN IN West Virginia, William G. Jackson began oil field work as a pipe liner in the West Virginia oil fields during summer vacations while still in high school. While attending Marietta College, he majored in chemistry and later, at the University of West Virginia, his major was metallurgy. Completing his education at the Colorado School of Mines, he received the degree of petroleum engineer in 1932.

During the summers of 1929 and 1930, he was employed by General Petroleum Corp., Santa Fe Springs, Calif. From 1932 to 1935, he worked in Warren county, Ky., and was roustabout and engineering aide for Superior Oil Co., Bosco field, Lafayette, La. From October, 1935, to February, 1943, he was with Stanolind.

From February, 1943, to November, 1946, he was employed by the U. S. Department of the Interior Bureau of Mines Petroleum and Natural Gas Division, as petroleum engineer in connection with drilling activities and construction of pipe lines serving the Navajo Helium Plant, Shiprock, N. Mex.

W. G. Jackson

Welding

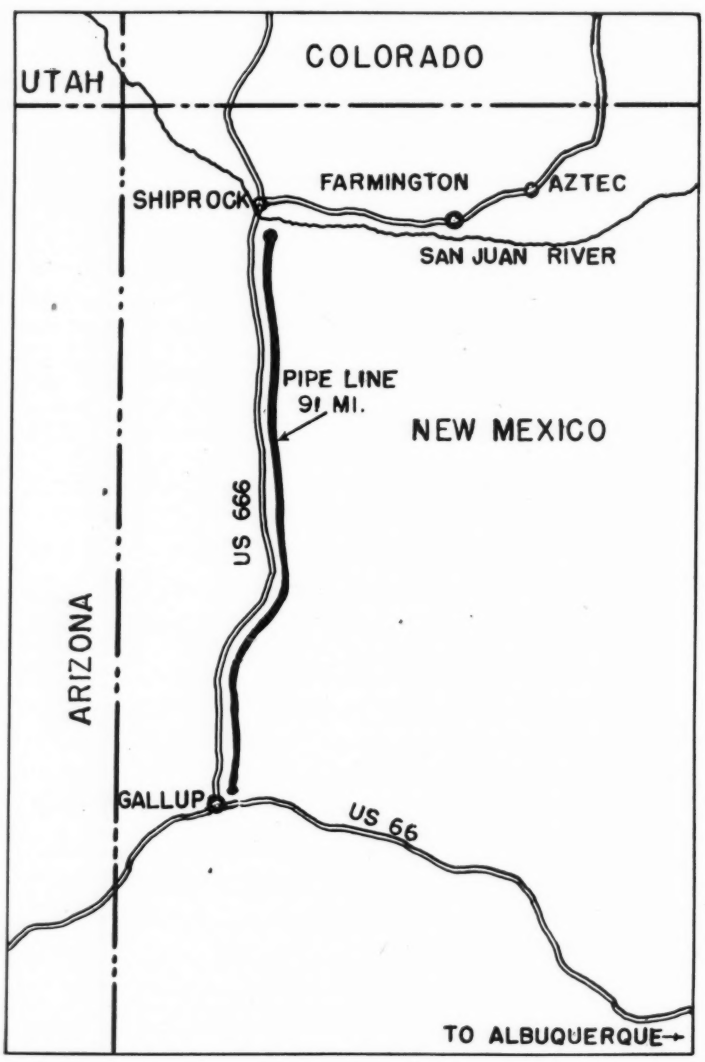
HELIUM'S physical characteristic of a higher diffusion rate than natural gas (approximately 3:1) and the greater monetary value of the former made it imperative that the finished line be free of the so-called nuisance leaks normally tolerated in natural gas pipe lines. The Bureau conducted a search for a type of weld that would be non-porous in texture and uniform in nature, a weld that—even in the number required in construction of a line of this length—could be confidently depended upon to be leak-free. Investigation was made of a welding method, new at that time, known as "pressure weld," used by the El Paso Natural Gas Co., which had developed equipment and adapted its use to pipe line construction. Sample welds were made by this process and extensively tested, whereupon the method was chosen as suitable for the requirements of this high pressure line. Pressure Weld is a mechanical process similar in principle to forge welding or blacksmithing, in that heat and pressure are combined to make the weld. No welding rod or extraneous material is added, but instead it is claimed that the bond is formed by fusion and recrystallization of the metal at a temperature below the melting point of the metal being joined. The blacksmith overcame one of the most objectionable features in forge welding, that is, the formation of oxide scales on the bonding surface, by using flux to exclude oxygen from the heated metal and by hammering to remove scale before the surfaces were joined. In the pressure method of welding, the ends of the pipe to be welded are freshly ground, and the two faces to be joined are held firmly together throughout the entire heating period and enveloped completely by non-oxidizing gases from a circular heating head, so that oxygen is excluded from the welds and oxide scales have no opportunity to form; thus is produced a uniform, non-porous weld.

Prerequisite to perfect welds is proper beveling of joint ends to assure the desired upset of the finished weld; moreover, the surfaces to be joined must be free of all grease, rust or other foreign matter. To guarantee clean bonding surfaces, the joint ends were thoroughly sanded by means of a portable machine and the inner surface of the joint swabbed out thoroughly just before it was placed in the welding clamp. Welding procedure following face preparation consumed less time in its performance than that required to describe it: actually, less than two minutes per weld, including moving time between joints. The time required to make the weld depends upon wall thickness of the pipe and is not influenced by its diameter. The prepared joints were placed in position end to end, and a combination pipe clamp and heating head was lowered and closely fitted around the abutted pipe ends. The joints were then aligned and clamped in place, in which position they were held during the heating period and until the weld was completed. By means of a circular acetylene burner, heat was applied simultaneously to all of the bonding surface until the metal became plastic but not molten; thereupon, end thrust was applied to the joints, which caused the plastic metal to be joined, upsetting at the same time, both internally and externally, an amount controlled and predetermined by the bevel angle and by the amount of end thrust applied. This completed the weld, and the clamp was immediately unlatched and moved to the next joint.

The resultant weld was found to be stronger than the remainder of the pipe from which it was made, and the upset furnished additional wall thickness, providing greater assurance against joint failure in handling. Pinholes resulting from porous welds were unlikely because of the forging action and because no extraneous material was added.

Convenient Location

As the pipe line was located conveniently near the highway, pipe-stringing trucks were able to handle heavier loads and longer lengths of pipe. Because of this, a stationary pressure-welding unit was placed in operation at the unloading yard for double jointing the pipe as received and unloaded from flat cars. The time required to



Route of 2500-psi pipe line.

rack-weld or double-joint two single units of pipe was 48 seconds per weld, compared to two minutes per field weld; thus the welding time required to complete the entire job was considerably decreased.

The line was welded under most adverse winter weather conditions, in many cases to the extent that strung pipe was completely hidden from view under the snow. Despite these adverse conditions, the work progressed according to schedule, and the 90-odd miles of line, containing 20,538 welds, was completed in 55 days.

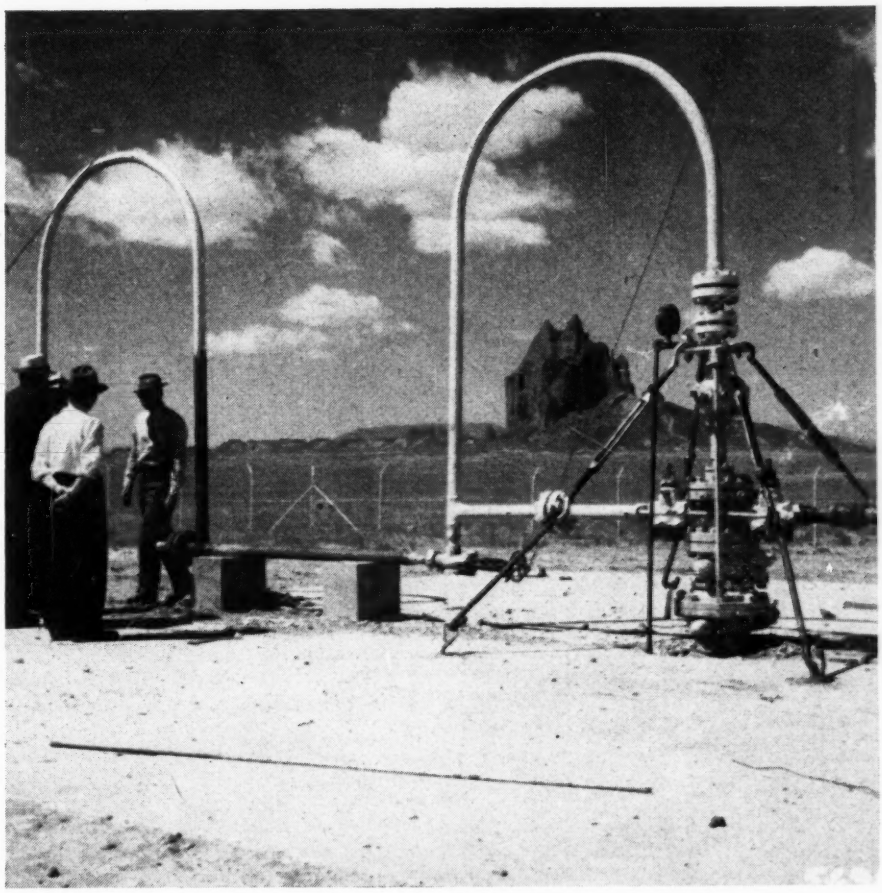
Sampling Coupons

CONSIDERABLE precautions were taken against faulty welds getting into the line. Competent inspectors witnessed the welds as they were made, and at the inspector's request, coupons were cut and immediately tested so that misadjustments could be corrected at once if the doubtful weld failed. To pass this test, the coupon straps were required to break in the pipe at or above the specified tensile strength of the material and a break in the weld even above the tensile strength constituted a weld failure. From a total of more than 500 welds tested only one failure occurred. As only those welds about which the inspector had expressed doubt were tested, one failure in 500 tests represents a very small percentage of the total number of welds made.

The fact that only two faulty welds were undetected by the crew and inspectors and got into the line speaks well for welding crew and method. One imperfect rack weld got into the line and was broken as the result of the rough handling to which the welded line was subjected for the purpose of making sure that no weak joints would escape detection. The other faulty weld and the only one that proved to be porous remained undetected throughout construction and was found after the line was put in operation.

Testing

Although it is not common practice to test cross-country gas pipe lines hydrostatically, it is almost universal practice to test all pressure vessels hydrostatically within a plant area at one and one-half times proposed operating pressure. Hydrostatic testing of this line was considered, but adverse winter weather made this undesirable. It was undesirable also because pinholes, if present, would fill with water, and this would prevent a reliable pressure-drop test with gas at a later date. Eventually these pinholes would become unplugged and might allow helium leakage in an intolerant volume, for helium will diffuse through minute openings through which water cannot be observed to leak under similar pressure. Accordingly, with a stipulation of certain precautionary measures, a gas-pressure test was decided upon.

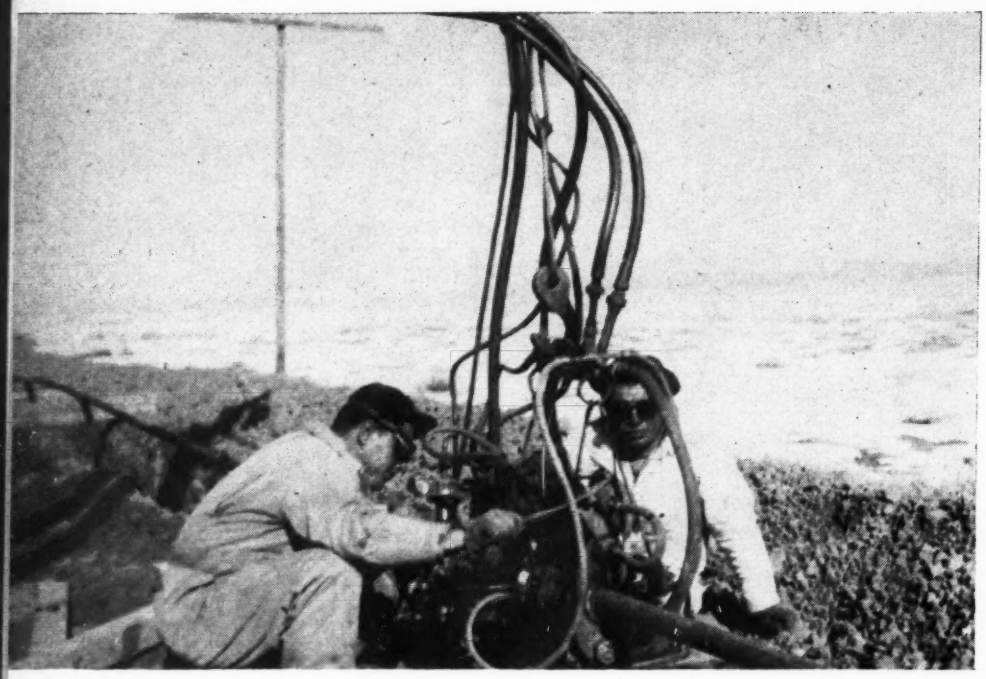


In Rattlesnake Field, the 3000-psi gas well from which helium-bearing gas is obtained.

Bureau of Mines wells supplying gas from which the Navajo plant extracts helium produce an incombustible gas mixture essentially of nitrogen and helium. Wellhead pressure is 3000 psi, and production is so prolific that ample gas was available at the opening of a valve. The hazards associated with the use of compressed gas for testing were realized, and adequate precautions were taken to minimize the danger accompanying its use.

A dozen or more 2-ft. lengths of the 2-in. pipe cut out at random from the stock pile were pressure-welded in series to form a composite test joint. No special attention was given to the short lengths selected or to their preparation or actual welding, so that the test joint would be closely representative of what the finished welded line would be. This test specimen was hydrostatically tested by pressuring it to 8000 psi, releasing the pressure, and repeating three times, leaving the pressure on for 30 minutes the last time. Following these tests, each weld of the test joint was couponed and critically examined for signs of failure, but none was found. By virtue of this test, it was concluded that the pipe line could be tested with gas at 3000 psi safely, provided specified precautions were strictly observed throughout. Not a single lost-time accident occurred throughout the entire construction period, or in testing and trial operation of the line.

All phases of construction work were coordinated as closely as possible to eliminate undue delay to the job. Test sections were pressured up during early morning hours before the surface of the line was dry enough for the enamel crew to begin applications. Valve assemblies with blow-offs located at five-mile intervals in the line arbitrarily defined the length of sections to be tested. The sections of line were conveniently pressured up or depressured, and isolated from pressured sections by opening or closing appropriate valves in such a manner that at no time was any crew of workmen required or permitted to handle any portion of the line under gas pressure.



Welding the 2-in. high pressure helium pipe line.

Two separate tests were made: (1) the line was pressured to 3000 psi to invite failure of weak spots in the pipe or faulty workmanship overlooked in the welds; and (2), after having withstood the higher pressure, the section was again repressured to 1000 psi and carefully examined for pinhole leaks. During the first part of the test at the higher pressure, the line was lying in the open ditch and was sand-bagged at road crossing and other points where any line break would endanger lives of workmen or persons on the nearby highway. Danger signs were displayed conspicuously and guards posted near danger points during the entire time any unburied portion of the line was under pressure. Between tests 1 and 2, the test section was entirely depressured, raised from the ditch, placed on skids, and repressured to 1000 psi. The outer surface was then generously covered with a rich solution of soap suds and carefully inspected for pinhole leaks, following which the outer surface was thoroughly washed with a spray of hot water until free of its soapy film. Some laminated pipe had been found early in welding operations and, on the presumption that some might have been overlooked, not only the welds but the full length of the joints and the entire outer surface of the pipe were soaped and inspected. As a result of these tests, four split sections and two pinhole leaks in the pipe were discovered and replacements made, following which the involved five-mile section was again tested. In more than 90 miles of line containing more than 20,000 welds, only one leak escaped detection by the testing crew. This was disclosed later by a pressure-drop test.

Following the soap test, other phases of construction proceeded in accordance with standard practice. All the pipe was new, received directly from the mills (and all but a few thousand feet was free of pipe lacquer), and after welding, was hand-cleaned with wire brushes and treated with a single coat of primer paint. Then it was machine-covered with corrosion-resistant enamel and machine-wrapped with protective felt, and was lowered into the prepared ditch. The trench was then back-filled.

Automatic Shut-Off Valves

Low-pressured natural gas pipe lines have block valves intermittently spaced so that sections of line can be isolated for repairs. Because helium was of critical importance as a war material not readily replaced, the protection afforded by manually operated valves was considered inadequate, and at an early date the bureau planned against unnecessary loss by including automatic shut-off valves in the construction of this high pressure gas line.

Carl E. Baird, mechanical engineer of the Bureau of Mines staff, designed for the line an automatic valve which closes in case of excessive gas flow in either direction. It bears the name "Baird Automatic Forward and Reverse Excess Flow Valve Assembly." It incorporates the working principles of the differential of an orifice meter. Essentially, it consists of a flow channel to which are attached two connected mercury float chambers, one on either side of an orifice through which gas flows when the valve is open. Excessive flow, either due to irregular operation or line failure, causes unbalanced conditions to be brought about in the mercury columns, so that a ball resting on top of a float riding on top of the mercury is lifted into the gas stream and is seated by the flow of gas, automatically shutting off further flow through the line until the pressure on either side of the closed valve is again equalized. The capacity of the valve is changed by variation of the orifice used or the amount of mercury in the float chambers. Eighteen of these valves were installed in the line, spaced five miles apart, and housed in locked concrete boxes to protect them from roving stock or molestation by curious persons. These valves operated quite satisfactorily.

Bridges

Few things detract from the general apperance of a pipe line installation more than unsightly, sagging, overhead crossings. Early in the planning of this pipe line, preference was eminently in favor of some type of rigid bridge structure. The selection was a simple Pratt truss fabricated in assembly-line manner at the plant yard, then hauled "in toto" on trailer trucks and installed on the line. The cost was comparable with that of equivalent anchored cable catenary suspensions, but the bridges were less vulnerable to acts of sabotage, because of the rigid interlocking construction of the truss members. The resultant bridge, consisting of 4-in. line pipe, the top member of which serves as a conduit for the 2-in. pipe line, is a sturdy, self-supporting structure; yet it is trim in its lines and picturesque in its setting.

Corrosion Protection

In addition to the covering of enamel and felt in protection against corrosion, installations of copper oxide rectifying units at either end of the line furnish cathodic protection. Originally the bureau intended to include intermediate installations which, because of the absence of electric power line, would necessarily have been either wind-driven or butane-engine-powered. Later, this idea was dropped and cathodic protection was obtained by magnesium anodic installations. These magnesium anode units serve essentially as dry cell batteries and are buried

in the more moist soil spots along the line and connected to the pipe line by insulated copper cable. Electricity generated by disintegration of the material used in the installation flows into the line, affording the desired protection. The amount of current is governed by the number of anodes used, and 100% protection is obtained by proper spacing of the anode nests.

Trial Operation

FOLLOWING completion of construction work, the entire line was pressured up with natural gas (nitrogen-helium mixture from the bureau's gas wells). It then was shut in, and existing pressures and temperatures were observed for 48 hours. Upon completion of this shut-in test, the line was reported ready for operation.

Soon after completion of the pipe line, the Navajo Helium Plant began cooling down for its shake-down run and in a few hours was producing helium of high purity suitable for shipment. Recorders on either end of the line furnished continuous chart records of the purity of the helium passing through. When the terminal recorder at Gallup began showing helium of high purity coming through, the pipe line was shut in to build up to operating pressure. In building up pressure in the line, the automatic shut-off valves with which the line was equipped were by-passed, and the flow was directed through the by-pass lines until full operating pressure was attained. When the pressure had built up to 2400 psi, tank car loading lines at the Gallup Terminal Station were coupled up, regulator controls were set to maintain no less than 2200 psi, the loading-line valve was opened, and the first tank car of helium from the Navajo plant was in the process of being loaded. Less than 24 hours later that tank car was topped out at shipping pressure and was on its way to the navy.

Rate of input to and discharge of gas from the line are controlled by regulators, which are located at either end of the 90-mile line in order to prevent valve closure caused by compressor pulsations or erratic withdrawal. Thus, equipped with recorders to show purity, regulators to prevent irregularities in operation, orifice meters to measure the volume of helium handled, and automatic shut-off valves to protect against loss, the line operates almost automatically.

At the finish of the shake-down run, operations at the Navajo plant were suspended so that recommended changes chould be made and the condition of the pipe line could be checked.

Recording pressure gauges at either end of the line showed a small pressure drop at the end of the first day, indicating that a leak was present. All 18 sections of line were blocked off one from the other, and the pressures were checked after 24 hours. Seventeen sections retained their original pressure, but the 18th showed considerable pressure drop.

Various methods are used to detect the location of leaks from gas lines containing hydrocarbon gases, but these are of no avail in searching for helium leaks, since helium is a colorless, odorless, tasteless gas, non-detectable by sense of sight or smell. Any foreign odorizing substance introduced into the line would contaminate the helium, making it unfit for use for possible medicinal purposes, and therefore was undesirable. A listening device was unsuccessfully tried and discarded.

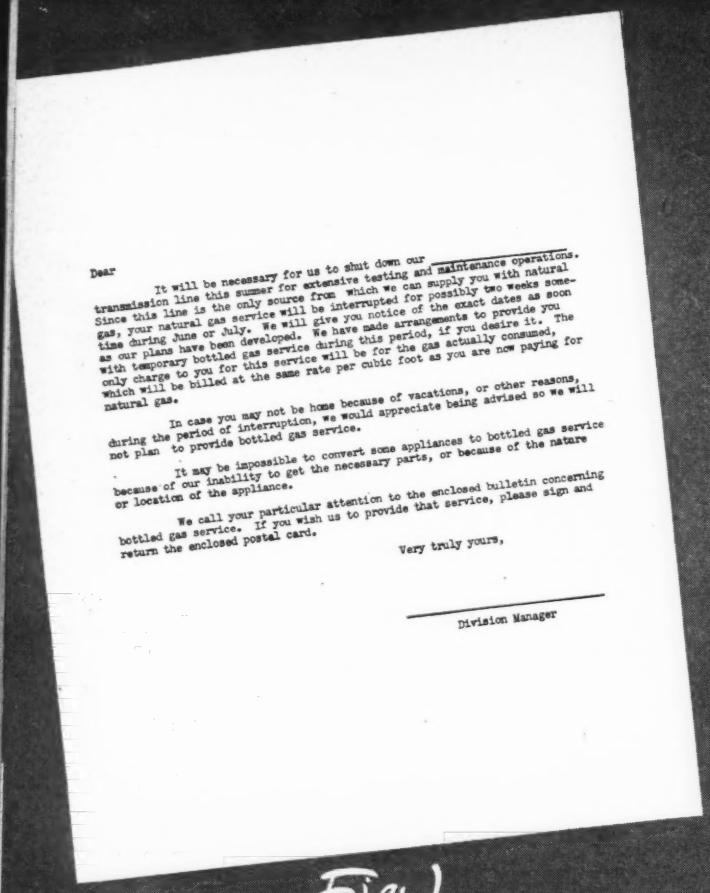
Trailing the Leak

Fortunately, the leaky section was adjacent to the Gallup Terminal Station, and it was little trouble to equalize its contents into storage facilities of the station. Then, by successive steps, one-mile sections were blocked off (by cutting the line and welding in temporary valves), repressured, and observed for pressure drop for suitable periods. In like manner, when the search for the leak had been narrowed down to one mile, this distance was subdivided further until the search narrowed to a 1000-ft. section, which was uncovered. The wrapping and enamel coating were removed and the leak located. Repairs were made, all temporary valves were removed from the line, and another pressure-drop test made. Pressure was equalized throughout the line, and it was again blocked off into 18 isolated sections, each containing 2000 psi pressure, as measured by a dead-weight gauge. For 10 days this pressure was kept on each of the isolated sections; at the end of that time, the sections were again checked with a dead-weight gauge and each was found still to contain 2000 psi within the pressure- and temperature-measuring limits, thus establishing that the line was satisfactorily leak-free.

According to an oft-repeated maxim "the proof of the pudding is in the eating," and so it is with this pipe line. Although initially somewhat of a venture into the unknown, this 2-in. pipe line, some 90-odd miles long, containing some 20,000 welds, and operating at 2500 psi, has successfully transported helium, a relatively costly gas far more susceptible to leakage than natural hydrocarbon gases, and construction of the line has been amply justified by its performance.

The line is unique in the type of gas it carries, in its freedom from leakage, in its provision of automatic shut-off valves, and in being the longest high-pressure cross-country pipe line ever built. Although only 2 in. in diameter, it might be called "The World's Biggest Little Pipe Line."

Bridge structure used in crossing arroyos.



Dear

It will be necessary for us to shut down our _____ maintenance operations. transmission line this summer for extensive testing and Since this line is the only source from which we can supply you with natural gas, your natural gas service will be interrupted for possibly two weeks sometime during June or July. We will give you notice of the exact dates as soon as our plans have been developed. We have made arrangements to provide you with temporary bottled gas service during this period, if you desire it. The only charge to you for this service will be for the gas actually consumed, which will be billed at the same rate per cubic foot as you are now paying for natural gas.

In case you may not be home because of vacations, or other reasons, during the period of interruption, we would appreciate being advised so we will not plan to provide bottled gas service.

It may be impossible to convert some appliances to bottled gas service because of our inability to get the necessary parts, or because of the nature or location of the appliance.

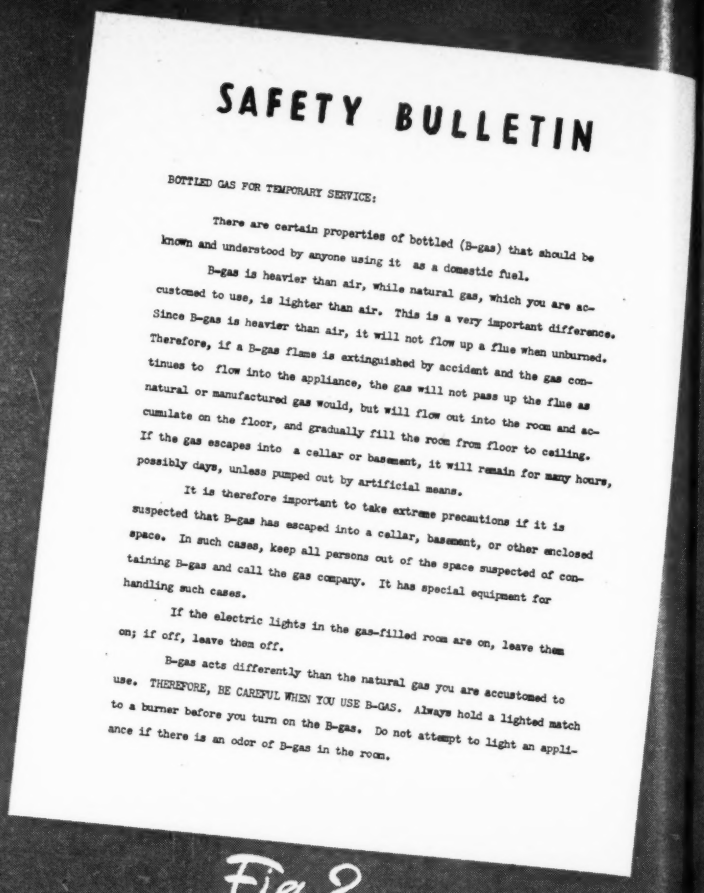
We call your particular attention to the enclosed bulletin concerning bottled gas service. If you wish us to provide that service, please sign and return the enclosed postal card.

Very truly yours,

_____

Division Manager

Fig. 1



SAFETY BULLETIN

BOTTLED GAS FOR TEMPORARY SERVICE:

There are certain properties of bottled (B-gas) that should be known and understood by anyone using it as a domestic fuel.

B-gas is heavier than air, while natural gas, which you are accustomed to use, is lighter than air. This is a very important difference. Since B-gas is heavier than air, it will not flow up a flue when unburned. Therefore, if a B-gas flame is extinguished by accident and the gas continues to flow into the appliance, the gas will not pass up the flue as natural or manufactured gas would, but will flow out into the room and accumulate on the floor, and gradually fill the room from floor to ceiling. If the gas escapes into a cellar or basement, it will remain for many hours, possibly days, unless pumped out by artificial means.

It is therefore important to take extreme precautions if it is suspected that B-gas has escaped into a cellar, basement, or other enclosed space. In such cases, keep all persons out of the space suspected of containing B-gas and call the gas company. It has special equipment for handling such cases.

If the electric lights in the gas-filled room are on, leave them on; if off, leave them off.

B-gas acts differently than the natural gas you are accustomed to use. THEREFORE, BE CAREFUL WHEN YOU USE B-GAS. Always hold a lighted match to a burner before you turn on the B-gas. Do not attempt to light an appliance if there is an odor of B-gas in the room.

Fig. 2

Figs. 1 and 2. Letter advising customer of proposed shutdown and offering bottled gas service; and safety bulletin explaining characteristics of bottled gas and the hazards incident to its use.

AUXILIARY GAS SUPPLY

During Transmission Line Shutdowns

PERIODICALLY a transmission line must be shut down for reconditioning, renewal, and testing. To facilitate the work it is often desirable to shut down the entire line. Under certain conditions, the line may be removed from the ground and transported to a distant point for reconditioning. Even under the most favorable conditions, this type of work extends over a period of several weeks. As there are usually services on transmission lines, it would seem desirable to examine means of providing an auxiliary gas supply to consumers during a shutdown.

After some consideration, it has appeared that one practical method of maintaining service to these consumers during the progress of the work is by the use of liquefied petroleum gas.

The following is a report of various conditions encountered during establishment of an auxiliary gas supply. The material is presented in outline form for the purpose of clarity.

Presented at PCGA Utilization Conference, Los Angeles, Feb. 26-27.

Planning for Conversion

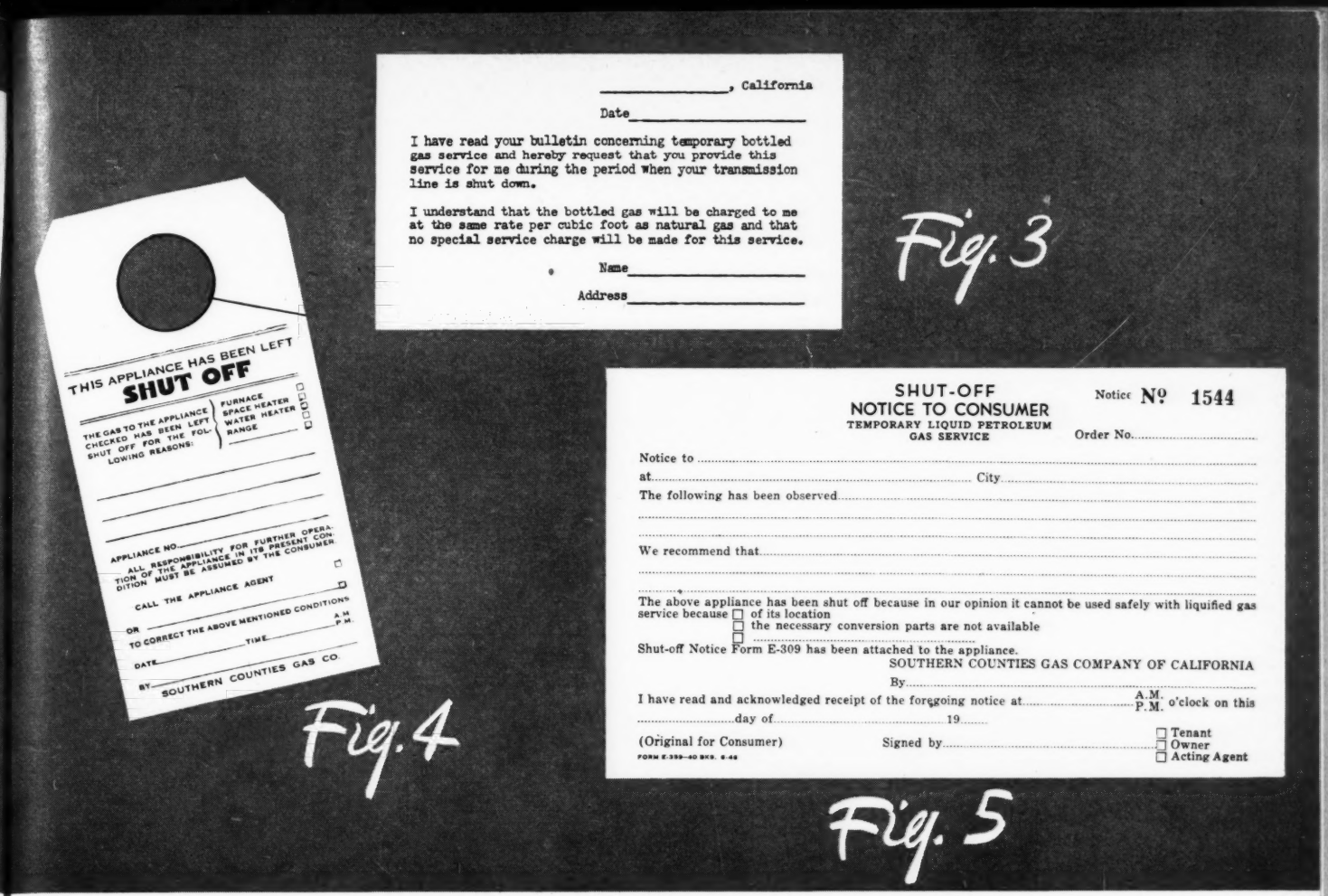
1. Methods of Determining the Number of Consumers Desiring Bottled Gas Service—To plan properly the total requirements for rendering temporary bottled gas service it is desirable to obtain a request for service from each consumer. This information can be obtained by mailing the following forms to each consumer affected by the shutdown.

Letter advising consumer of the proposed shutdown. (See *Fig. 1.)*
Safety bulletin explaining the characteristics and use of bottled gas. (See *Fig. 2.)*
Return postal card, to be used by the consumer for a request or rejection of bottled gas service. (See *Fig. 3.)*

2. Survey of Consumer's Appliances—Based on the requests for service received on the postal card survey, a call should be made on each consumer and a survey of the premises conducted, to obtain the information required for planning the conversion.

3. List of Special Materials Required—At the conclusion of the field survey an estimate of special material required to install the bottled gas tanks and the special parts required to convert the appliances can be assembled. The following list contains examples of special materials which will be required:

a. Materials required to install bottled gas tanks:
   1. Pigtail connections
   2. No. 214—¾ in. plug valves
b. Materials required to convert appliances:
   1. No. 1 orifice adapters
   2. No. 1 plug orifices
   3. No. 8 plug orifices


_____, California
Date_____
I have read your bulletin concerning temporary bottled gas service and hereby request that you provide this service for me during the period when your transmission line is shut down.
I understand that the bottled gas will be charged to me at the same rate per cubic foot as natural gas and that no special service charge will be made for this service.
Name_____
Address_____
Fig. 3
THIS APPLIANCE HAS BEEN LEFT
SHUT OFF
THE GAS TO THE APPLIANCE CHECKED HAS BEEN LEFT SHUT OFF FOR THE FOLLOWING REASONS:
FURNACE
SPACE HEATER
WATER HEATER
RANGE
APPLIANCE NO.
ALL RESPONSIBILITY FOR FURTHER OPERATION OF THE APPLIANCE IN ITS PRESENT CONDITION MUST BE ASSUMED BY THE CONSUMER.
CALL THE APPLIANCE AGENT
OR
TO CORRECT THE ABOVE MENTIONED CONDITIONS
DATE
TIME
A.M. P.M.
BY
SOUTHERN COUNTIES GAS CO.
Fig. 4
SHUT-OFF
NOTICE TO CONSUMER
TEMPORARY LIQUID PETROLEUM GAS SERVICE
Notice No. 1544
Order No.
Notice to
at
City
The following has been observed
We recommend that
The above appliance has been shut off because in our opinion it cannot be used safely with liquified gas service because
of its location
the necessary conversion parts are not available
Shut-off Notice Form E-309 has been attached to the appliance.
SOUTHERN COUNTIES GAS COMPANY OF CALIFORNIA
By
I have read and acknowledged receipt of the foregoing notice at
A.M. P.M. o'clock on this
day of
19
(Original for Consumer)
Signed by
Tenant
Owner
Acting Agent
FORM E-309—40 BKS. 8-46
Fig. 5

Figs. 3, 4, and 5. Return postal card acknowledging receipt of letter (see Fig. 1) and accepting or rejecting bottled gas; shut-off tag and notice for use with water heaters not equipped with 100% safety pilots (see Table 1).

Recommended procedures for use when substituting bottled gas service during periods when a line must be temporarily placed out of service.

By VIRGIL JURY

Southern Counties Gas Co., Los Angeles

4. No. 11 plug orifices
5. No. 79 or smaller Servel orifices
6. Single slot turbulators (Servel)
7. Tips for Barber burners for use with LP-gas
8. Tips for Crane water heater burners for use with LP-gas
9. 3/16-in. O.D. aluminum tubing
10. 3/16-in. tubing unions
11. Watrola pipe joint gum
12. ⅛-in. pipe plugs
13. 4 x 6 in. cloth shipping bags with drawstring. (Bags to be used to store parts removed from appliances, such as valves, springs, controls, and orifices. Bags of parts to be attached to the appliance.)
14. Special shipping tags with reinforced holes for tag wires. (Tags to be used for identifying parts removed from appliances.)

4. Cost Estimate—A preliminary estimate of the cost of the conversion should include the following factors:

1. The time required to install the bottled gas tanks.
2. The time required to convert the appliance to operate on bottled gas.
3. Maintenance of the tanks for duration of the shutdown.
4. Removal of the tanks at the conclusion of the work.
5. Reconversion of the appliances to natural gas.
6. Materials required to convert the appliances.
7. Automobile mileage.

5. Estimate of Tank Requirements—The number of tanks required will depend upon the total load requirement of a given premise. It may be concluded that the number of tanks installed will vary from one to five. This estimate is based upon a decision to install the minimum number of tanks that will adequately supply the demand of the appliances connected.

6. Assistance from Bottled Gas Dealer—Should the preliminary study indicate that an adequate supply of tanks will be difficult to obtain, assistance from a bottled gas dealer may be obtained.

The following typical example will serve to illustrate the type of assistance available through many bottled gas dealers:

In advance of a proposed shutdown, the preliminary study indicated that an adequate supply of tanks would be difficult to obtain. A small supply of 25-gal. size was available to supply consumers located along one section of the line. The decision was made to contact local LP-gas dealers and obtain bids on supplying tanks for the balance of the consumers.

A dealer was contacted who was equipped to handle this work. Accordingly, the dealer and a company representative conducted a survey of

the area. This survey resulted in a proposal by the dealer which included the following points:

1. To supply tanks in adequate quantity and sizes to supply all consumers, the supply to include 25, 50, 130, 250, and 500-gal. sizes.

2. To locate the bottles at the meter installations and connect the bottle into a valve installed at the meter for this purpose; to furnish labor and materials at a flat charge to connect larger tanks which may be located some distance from company facilities.

3. Tanks to be supplied on a rental basis (including placing of the tanks in a safe location).

4. Filling and refilling of tanks and acceptance of the responsibility of providing an adequate supply of propane, the fuel costs to be billed at the following rates:

25-gal. size	$.10/gal.
50, 130, and 250-gal. sizes	.07/gal.
500-gal. size	.07/gal. for the first filling
and	.065/gal. for refilling

The fill costs were to include the dealer's daily check of the 50- to 500-gal. sizes and refilling as required, the company to assume the responsibility of notifying the dealer when any of the 25-gal. bottles required refilling.

5. All miscellaneous labor and material, such as installing additional piping, heat exchangers, and any similar work necessary to complete and maintain the auxiliary gas supply.

6. The removal of the tanks upon completion of work.

Preliminary Outline and Instruction to Men Assigned to Appliance Conversion Work

1. A review of the entire program of proposed conversion and specific information and instructions for converting the appliance was reviewed with all men assigned to this work.

2. Each man was supplied with a preliminary outline governing the methods of appliance adjustment and precautions necessary in converting from natural gas to bottled gas. This outline presented the type of information contained in *Table 1.*

Experiences During Actual Conversion

A brief review of some of the problems encountered during the actual conversion may prove of value in future conversions.

Leakage—Small leaks at range valves, water heater valves, adjustment caps and houselines required more time to repair than had been anticipated. Several leaks were found in piping at union joints. Both the standard ground joint pipe union and tubing nut connectors were a source of leakage. The correct consistency of the soap suds is quite important in checking for small leaks. In cases where the meter test indicated leakage and soap testing did not disclose the exact location, the yard piping was cut at the building and tested to the meter. Any leakage in excess of 1 C.F.-H. was repaired. Leakage under 1 C.-F.H. when found to exist in the yard piping and where there was extensive yard piping was not repaired. In no case was it necessary to discontinue service because of leakage.

Water Heaters—In general, the adjustable main burner orifices were not satisfactory. In most cases it was necessary to remove the burner and install an orifice insert adapter and drill to correct size.

Water heaters with main burner safety and no pilot safety were left on automatic operation if the main burner safety proved to be in good condition. Automatic operation with a fairly high pilot was most satisfactory for the following reasons:

a. The consumer might inadvertently leave the appliance on and leave the premises not being accustomed to manual operation.
b. Many heaters are so situated that manual lighting becomes quite difficult.

Space Heaters and Furnaces—All connected heating appliances were easily converted by installing fixed orifices.

TABLE 1. INSTRUCTIONS ON APPLIANCE ADJUSTMENT

General Instructions

1. Check for most suitable and alternate location for the bottled gas tanks, if other present meter locations.
2. Isolate and repair leaks in housepiping before instigating service with bottled
3. Instruct consumers that if any pilot goes out (particularly on water heaters), appliance must be turned off and a call made to the gas company requesting that pilot be relighted. The consumer should be further instructed that no electric swi should be turned on or off during this time.

APPLIANCE ADJUSTMENT

1. Top burners should be adjusted for an input of approximately 7000 Btu's. A adjustment should be made to obtain lengthening of the flame and yet to a smoking of the utensils; adjustments should be made when the burners are
2. Fixed orifices need not be installed if a satisfactory adjustment can be obta with the adjustable orifice.
3. Automatic pilots on ovens should be eliminated. The oven bypass flame shoul adjusted approximately ⅜ in. high. Oven safety shut-off devices are to be set permanently open position. This will permit manual operation of the oven. I use of an automatic oven can be dispensed with, the oven should be plugged off. oven burner input should be lowered until a satisfactory flame is obtained. A flame should be avoided when burner is enclosed in a combustion chamber.
4. Clock valves must be opened.

WATER HEATERS

1. Where operative 100% safety pilots are not present on water heaters, the follo procedure will be used:
   a. Where the water heater is located in a readily accessible location (not in a basement), the consumer should be questioned as to the possibility of the heaters being operated by persons other than the individual being questioned, or by persons outside the immediate family. If this possibility exists, the heater should be tagged with "Shut Off Notice." (See *Fig. 4.*) A written notice should also be issued to the consumer stating the water heater is unsafe for use with LP-gas. (See *Fig. 5.*)
   b. If no person but the individual contacted or one of the immediate family will operate the water heater, the following procedure will be used: The pilot will be shut off, and, if automatic, the valve removed. The thermostat valve will be removed and the burner converted to operate on LP-gas. A form notice should be issued to the consumer stating the heater has been converted to manual operation and must be lighted and turned off as required. A tag will be attached to the water heater main burner valve stating that the heater is to be manually operated, with instructions for lighting and turning off. The consumer will then be instructed on the exact procedure to follow when lighting and turning off the water heater. A lighter rod should be provided as an aid to lighting the burner.

Ranges—No problems were encountered in converting domestic ranges.

Servels—No problems were encountered in converting Servel refrigerators.

Gas Lights—Gas lights were disconnected and the outlets capped. The only difficulty encountered with the gas light was in replacing mantles broken when the lights were disconnected.

Natural Gas Engines—Whenever standby facilities were available, consumers were asked to operate their gas engines on standby. When no standby was provided, engines for rural lighting units and water well pumps were converted by minor carburetor adjustment.

Tank Installation—In the majority of the cases, a small bottle was connected directly to the meter inlet. In some cases where the cost of individual bottles would be excessive, and time could be saved, a large tank was connected to a main or service so that several consumers were served from one tank. These installations were regulated to approximately 5 psi, and individual meter and regulator sets were not disturbed.

All high pressure regulator sets were physically disconnected and service risers plugged or capped. All services were exposed at the main and turned off, if there was a valve at the main.

Dairy Sterilizers—Small coil-type dairy sterilizers with high Btu input and equipment with Barber burners were difficult to convert. In order to get a good adjustment and still maintain the sterilizer output, it was necessary to enlarge primary air ports on some of the burner tips. This was especially true of the tips farthest from the firebox door.

Restaurant-type Ranges—Restaurant range burners with large ports were difficult to adjust. In some cases, it was found almost impossible to eliminate flashback whenever burners were extinguished.

Summary—To summarize the various jobs in the order of time consumed:

1. Testing and locating and repairing leakage.
2. Installing fixed orifices and adjusting water heaters.
3. Disconnecting appliances, such as space heaters, floor furnaces, and gas lights, and including capping of outlets.
4. Adjusting gas engines.
5. Adjusting ranges.
6. Adjusting Servels.

Other Considerations

Typical Appliances Disconnected and Reasons for Not Converting to LP-gas—

Space Heaters
- Not in use
- Parts not available

Ranges
- Not in use

Water Heaters
- Parts not available
- Location undesirable
- Not in use

Furnaces
- Located in basement
- Not in use

Walnut Dehydrator
- Not in use

LP Boiler
- Located in basement.

Special Applications—In some cases it may be advisable to make an extra effort to convert an essential appliance. Consideration should be given to the possibility of installing a 100% safety device to shut off the gas supply to the pilot and main burner in event of pilot failure.

Progress Report—It may be required that reports be assembled at frequent intervals during the progress of the work. In view of this possible requirement, it is advisable to make weekly follow-up calls to check the operation of the appliances. Such weekly reports should contain the following additional information:

a. Current status of the work on the pipe line.
b. Number of customers receiving bottled gas service.
c. Number of appliances disconnected.
d. Maximum length of time any consumer has been on bottled gas service.

LP auxiliary gas service is a practical method of serving customers on a temporary basis during a pipe line shutdown. The characteristics of heavier-than-air gas should be clearly understood and imparted to all persons concerned with the changeover.

AND PRECAUTIONS WHEN CONVERTING TO BOTTLED GAS

All heaters not having an operative 100% safety pilot will be disconnected or otherwise rendered inoperative, and properly tagged. A written notice will be issued to the consumer stating the reasons for disconnecting.

Water heaters in enclosed pits or basements which will not ventilate naturally by gravity shall be shut off.

a. Water heaters shall be changed to manual operation unless a very satisfactory adjustment of pilot and burner can be obtained.

Burner flame should be adjusted to lower input consistent with good combustion. Written form shall be used to impart operating instructions to the consumer.

Water heater burners with Barber type tips should be shut off entirely. An exception to this practice can be made if Barber type tips designed for use on bottled gas are available. In such case, the tips may be changed and the heater placed in operation. Avoid filling orifice in natural gas Barber tips with solder and redrilling. This practice is undesirable as a flashback or conducted heat may cause the solder to melt and create a smothering condition of the burner or a fire hazard.

Input to luminous flame burners should be lowered to a point where no sooting will occur. Input can be lowered to 10,000 Btu, and the heater used as a slow recovery type.

All water heater safety devices are to be checked and operative. Safety devices found to be defective are to be removed, and the heater converted to manual operation. Water heaters not equipped with safety devices are to be converted to manual operation.

Water heaters are to be shut off with throttling thermostats, furnaces, and space heaters.

a. Space heaters found connected with flexible covered hose are to be disconnected if their use can be dispensed with. If required, the heaters should be connected solid with pipe with ⅜ in. copper tubing.
b. Space heater burners, both throats and ports, are to be clean; the input to be lowered to a safe operating range.
c. Furnaces located in pits or basements should be shut off or otherwise rendered inoperative.

SERVEL REFRIGERATORS

Burners for Servels are to be made up for individual units. It is intended that the burner be exchanged in its entirety. Burners removed should be left at each refrigerator for reconversion.

GAS ENGINES

engines may be converted to operate satisfactorily on LP-gas. This conversion re-es the services of a specialist in gas engine operation. Requests for such conversions uld be handled as individual cases and referred to proper persons for follow-up.

LEAKS

ks in housepiping must be isolated and/or repaired before service can be instigated h LP-gas.

OPPORTUNITIES

By W. A. DARRAH

President, Intercontinental Engineers, Inc.

Chicago, Ill.

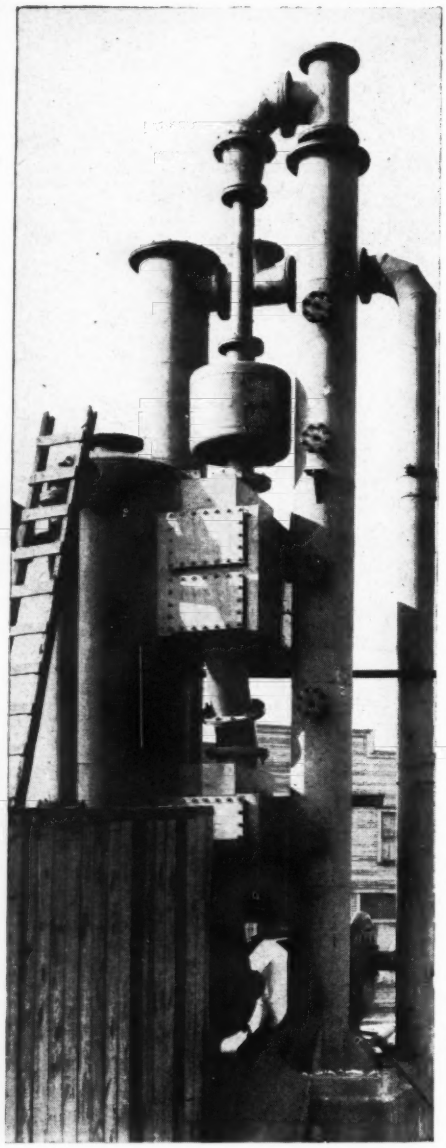


Fig. 1. Typical inert gas unit for metal distillation.

SOME two decades ago, the metallurgical industry first began to recognize *commercially* the wide range of reactions between heated metals and the atmospheres in which the metals were immersed.

Prior to that time, scaling of metal surfaces, decarburization, selective oxidation, and the whole range of associated problems were accepted more or less as inevitable and little effort was made to overcome these difficulties.

In this period, we devoted substantial time and expense to a thorough-going research of the effect of various atmospheres on heated metals and soon developed a line of atmosphere generators and industrial furnaces adapted to the utilization of controlled atmospheres.

This equipment is now a matter of history, and is being generally utilized throughout the metallurgical industry. Automatically controlled atmospheres are now made available for such operations as the carburization of steel, the nitriding of steel, controlled decarburization, bright annealing of nonferrous and ferrous metals, and a wide range of associated applications.

As our development work in the more orthodox metallurgical fields resulted in commercial equipment, we turned our attention to newer applications, some connected with metallurgy and others involving such widely scattered operations as food products, preserving and canning, chemical manufacturing, etc.

Metal Distillation

The war inevitably introduced new and interesting problems which offered opportunities for further application of inert gases.

One example of this is the reclaiming of the so-called "battle scrap" which represents millions of tons of brass, most of it in the 70-30 class. The bulk of this item is composed of shell cases and associated parts.

The amount of brass of this type is so great and the contamination in many cases so substantial, that the market for brass of this type in this form is not at present able to absorb the supply.

On the other hand, there is an increasing scarcity of copper and a shortage of zinc. Work done by the Revere Copper and Brass, Inc., and others led to the development of a process by which the zinc could be distilled from the copper (at around 3500° F.) and both the copper and zinc recovered in metallic form and in shape to be absorbed readily in the present market.

To heat brass successfully to a temperature such that it may be distilled and collected unchanged requires a very nice adjustment of atmospheres. Such atmospheres must be entirely free of water vapor, carbon dioxide, and carbon monoxide. Hydrogen should be maintained within a low limit and the atmosphere should consist substantially of nitrogen. Many metals when highly heated have a discouraging tendency to absorb substantial amounts of hydrogen with unfortunate results when the metal cools. *Fig. 1* shows a typical unit for metal distillation.

A similar application involving still more exacting atmosphere problems is the separation of aluminum from aluminum alloys. Very large tonnages of scrapped airplanes are available throughout the world. This scrap, of course, includes very little pure aluminum and is a heterogeneous mixture of numerous aluminum alloys. If the entire plane is melted in one mass, the resultant alloy in that form has a very low commercial value. On the other hand, if the aluminum scrap is pretreated in a melting furnace and then subjected to distillation in a controlled atmosphere, commercially pure aluminum, which commands a greatly enhanced price, may be separated from the alloying ingredients.

The problems of atmosphere in this case are considerably more complicated than in the case of brass distillation. Hydrogen is most readily absorbed by aluminum, causing numerous difficulties if the metal is to be rolled or extruded. Even nitrogen is absorbed to some extent, but it is generally considered the least harmful of the cheaply available gases. Water vapor is perhaps one of the most undesirable elements in treating aluminum, and any inert gases employed for this purpose must be most thoroughly dried.

The so-called rarer gases, of which argon is perhaps the most readily available, are excellent for this purpose, but somewhat costly. The addition of chlorine (and sometimes sulphur) to the inert atmsophere in the distillation of aluminum appear to give improved results.

Paint Manufacturing

From the earliest days, the paint industry has employed various oils and other compounds which during the so-called "drying operation" actually are subject to oxidation. The most commonly used natural oils are the well-known linseed oil and China wood oil, sometimes called tung oil. More recently, various modified forms of castor oil and other vegetable oils are finding an increasing use.

Presented at the A.G.A. Sales Conference on Industrial and Commercial Gas, Boston, March 17-19.

For Prepared Atmospheres

In the case of paints or varnishes containing these products, the so-called drying operation includes in addition to the evaporation of a solvent, the oxidation and polymerization of the oil.

The oxidation, of course, takes place when the oils are exposed to the air in the neighborhood of room temperature. The oxidation appears to accelerate the polymerization, and the two reactions are frequently closely associated.

Like the metallurgical industry, the manufacturers of paints and varnishes have for a long time been resigned to the oxidation of their products when exposed to the air during the manufacturing process or during the storage.

As in the case of metallurgical operations also, if oxygen is withheld from contact with the paints or varnishes, they do not harden or dry. As an illustration, paint manufacturers for many years have stored their products prior to shipment in large tanks with an air space above the layer of paint. Some large paint manufacturers have 100 or more large storage tanks serving as an intermediate storage into which the paint is pumped and withdrawn.

Obviously, as the paint is withdrawn from these tanks, the air must enter, and the oxygen of the air causes the paint to form a skin on its surface and also a tightly adhering skin on the inner surface of the tank. Continual use may build up the skin on the surface of the tank to an inch or more in thickness.

Such a condition represents a substantial loss of material, as well as a very appreciable cost for removing the film from the tank at intervals. By the simple expedient of maintaining an atmosphere of inexpensive inert gas above the liquid within the tank (thus excluding the oxygen of the air), the paint will not adhere to the walls of the tank and a skin will not form on the surface of the paint. It seems most unusual that such a simple remedy has only been recently applied in the plants of the large paint manufacturers, but such is the case.

The manufacture of paints and varnishes involves numerous operations where such an inert gas can be very helpful. For example, in the mills in which the paint is ground, in the small intermediate storage tanks, in the pipe lines used to pump the paint from one operation to another, the use of inert gas will save many times its cost in the course of a year.

Some manufacturers are now filling the air space above the cans with inert gas before sending cans for shipment to users.

A very important application in the paint and varnish field is in the manufacture of synthetic resins which are to an appreciable extent displacing the use of natural oils.

In the condensation of synthetic resins, various materials, as for example, thallic anydride and glycerol, are heated to 300° F. or slightly more, resulting in the elimination of water which must be removed from the reaction kettle. This can be most readily accomplished by the bubbling of substantial amounts of inert gas through the kettles, serving to reduce the vapor pressure of the water produced, thus hastening its removal and also agitating the plastic being formed.

In the case of the paint and varnish industry, carbon dioxide has been utilized for some time in the kettles employed for the manufacture of glyptols and other synthetic varnishes. Owing to the expense of carbon dioxide gas, however, its use has been greatly restricted, and it has not been employed in innumerable applications such as within storage tanks, for the blowing out of pipe lines, for use in mills, grinders, etc.

Carbon dioxide, whether purchased in the form of dry ice or as a liquid, ordinarily costs 20 to 30 times as much as inert gas produced from fuel gas. Naturally, the ratio will vary in each locality, but in even the most unfavorable locations, the margin is extremely wide.

As a result of this condition, the paint and varnish industry may readily be converted to the use of inert gas, providing a proper showing is made by an engineer familiar with the inert gas field and the paint and varnish industry. Without such a showing by a trained engineer, it is natural that considerable sales resistance is encountered.

The inert gas employed in the paint and varnish industry should contain no oxygen and preferably a very small percentage of carbon monoxide. Water vapor, nitrogen, and carbon dioxide form the bulk of the inert gas.

Fig. 2 shows a typical installation in a large paint and varnish plant. Many paint and varnish plants employ two or three duplicate installations in order to supply their requirements.

Fire Protection

As is generally known, carbon dioxide in liquefied form is becoming widely used as a fire protection medium. These units represent a considerable investment and involve some little maintenance expense.

The carbon dioxide may be retained intact for many months before it is used, so it is more or less a stand-by device rather than a continuing use. Naturally, when fire breaks out, the carbon dioxide must be available in large quantities and with great certainty.

As a fire extinguishing medium, carbon dioxide has the advantage that it will "drown" out a fire without damaging any materials. This is not true, of course, where water, sand, foams, and other substances are used, although of course foams offer the least difficulty from the standpoint of damage to products or to equipment.

Furthermore, carbon dioxide has no adverse effect on electrical insulation and will not damage motors or electrical equipment.

Inert gas made in the same manner

A LONG and distinguished career in the many phases of industrial engineering began in 1910, when Mr. Darrah started as development engineer with the Bell Laboratories in New York. Two years later he joined Westinghouse Electric Manufacturing Co., East Pittsburgh, Pa., in the capacity of engineer in charge of design of lighting and lighting equipment. From 1915 to 1917 he was manager of engineering of the Ohio [illegible] Co., Mansfield, and was plant manager of Noble Electric Steel Co., Heroult, Calif., to 1919, at which time he became president of Continental Industrial Engineers, Inc., Chicago, a position he still holds. He is also president of Intercontinental Engineers, Inc., and Engenheiros Continental de Brazil and Intercontinental, Argentina.

Fig. 2. Inert gas unit for paint, varnish industry.

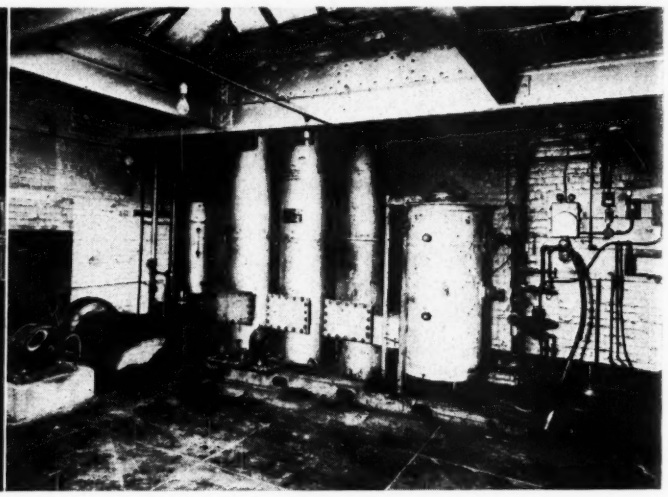


Fig. 3. Inert gas unit for protection of foods.

and from the same type of unit as recommended for the paint and varnish industry may be used very satisfactorily as a fire fighting medium, and as a stand-by fire protection. In order to use inert gas satisfactorily for this purpose, it is only necessary to supply a large storage tank (preferably 10,000 to 20,000 gal) which may be maintained continuously at a pressure of around 100 psi.

If such a tank is connected by large mains to a fire hose system, and provided with a series of quick acting valves, it is possible to deliver large volumes of inert gas with great rapidity. Such a condition will drown out fires. It is particularly desirable in chemical plants, paint plants, and in similar operations where the product, if mixed with water or other ingredients, is likely to be damaged.

Since the storage tank can be filled continuously on an off-peak basis from the inert gas unit used to supply the requirements of the plant, the fire protection feature is obtained with a relatively small investment and a very negligible operating cost.

With the proper installation, it would appear that the only advantage of liquefied carbon dioxide over the standard inert gas is the cooling effect which is produced when liquid carbon dioxide is converted from a liquid to a gas. In some instances, the cooling effect may be highly desirable, and in other instances, it may be equally undesirable.

The inert gas is just as certain a blanket for smothering a fire as the pure carbon dioxide.

Explosion Protection

Each year, serious losses occur due to the explosion of a mixture of combustible dust or combustible vapor with air. In order to obtain an explosion, at least three conditions must be satisfied:

1. **The amount of oxygen (from the air) must fall within the explosive range.**
2. **A spark or some similar ignition means must be provided.**
3. **The combustible vapor of dust must be combined within a room or chamber.**

Obviously, if the space containing the vapor or dust is filled with inert gas, the first condition will not be satisfied, and explosions will be impossible.

The list of dusts which may form the subject of very violent and dangerous explosions is so long that it is only possible to generalize. It may be stated broadly that any substance which may be made to burn when in a finely divided form, may cause an explosion if present as a dust.

Thus, such widely diverse materials as powdered metals (aluminum, magnesium, zinc, etc.), powdered starch, sugar, or grains, powdered chemicals and powdered coal, all have in various instances been the cause of costly and violent explosions.

The use of inert gases in bins, rooms or chambers containing such dust gives a very definite protection against explosion. In order to make such protection effective, it is necessary to provide automatic means of continuously sampling the atmosphere within the room or chamber to give a constant indication when definite traces of oxygen are present.

Protection against explosions from combustible vapors such as gasoline, naphtha, benzine, alcohol, etc., may be accomplished in a similar manner.

In the same way, it is frequently customary in chemical and other plants to purge a tank, vessel, or room with inert gas before introducing the material which carries the combustible vapor. In this case, a unit similar to that provided to the paint and varnish industry has proven very effective.

Inert Gas in Food Industry

Most all foods, and particularly those containing appreciable amounts of moisture, are subject to rapid deterioration when exposed to the air at normal room temperature.

Deterioration is due to a wide range of causes. Bacteriological action is one of the predominating causes. A second important cause of food deterioration in the atmosphere is oxidation. It is probable that in most instances bacteriological action and oxidation are inter-related and one involves the other.

While there are numerous bacteria which can exist in an atmosphere devoid of oxygen, many of the active bacteria can only live when a minimum amount of oxygen is present.

The common commercial method of controlling the deterioration of food products is by lowering the temperature (refrigeration) so that bacteriological action is either suspended or tremendously slowed. The velocity of most oxidation reactions is greatly reduced with a reduction in temperature.

While it is not suggested that an inert gas atmosphere be used to replace refrigeration, there are, nevertheless, many cases in which an inert gas will effectively preserve food products without refrigeration. In other cases, the addition of inert gas will increase the effectiveness of refrigeration as a preservative mechanism.

We have found commercially that an inert gas made from the combustion of fuel gas with air in the proper ratio will preserve the vitamin content of many canned foods. One group of circumstances which formed the basis of a special practical application was the

preservation of citrus fruit juices. It is of course well known that in closing cans, it is essential to leave a small volume of gas so that the liquid does not entirely fill the container. The so-called "air space" is provided to cushion the expansion of the liquid with temperature changes and avoid the bursting of the can. The small air space above the liquid in the can of citrus fruit juices contains sufficient oxygen to oxidize the vitamins within the juices and, in the course of a few months, they are practically all destroyed.

On the other hand, if we substitute inert gas for air in the small space above the liquid, the fruit juices may be stored indefinitely with relatively small depreciation and loss of vitamins. It also appears that the elimination of the oxygen reduces the loss of flavor in many canned foods. The subject of gas composition in preserved foods involves innumerable details, as the composition of the gas should be varied with the different food products to be preserved.

Thus, in the case of butter and milk products, it is highly desirable either to eliminate or to minimize the amount of carbon dioxide present. Carbon dioxide appears to react with the fats in the manner of an acid, causing objectionable taste changes even though the product has not actually deteriorated. Many citrus fruit juices will absorb carbon dioxide, which will cause difficulty and foaming when the can is opened. Most vegetables may be canned with carbon dioxide in any desired amount.

The competitive gas which is frequently used in the food industry is usually bottled nitrogen. The cost of this gas is ordinarily twenty to thirty times as much as the cost of an inert gas produced by the burning of fuel. Here again, the relative values depend on local prices, and each installation must be studied individually.

Protecting Foods From Pests

Tremendous tonnages of food are destroyed each year by rodents, as well as by bacteriological action. It has been estimated that enough food to feed the depleted countries of Europe could be made available through the elimination of the action of rats, mice, and insects.

Many insects—and of course all rodents—depend on oxygen, and if material stored is maintained in an atmosphere low in oxygen, insects and rodents cannot exist. It is therefore proposed that storage space in warehouses be kept full of inert gas, and that the continuous sampling device be provided for indicating the composition of the gas in various parts of the storage space.

Such an application would apply, of course, to grain, fruits, vegetables, sugar, nuts, and related items. This application may also be included for the storage of such products as furs, skins, woolens, and a wide range of other material. All of the various grains may be stored, and the inert gas will serve not merely as a protection against insects and rodents, but also as a protection against explosions from combustible dusts.

In passing, it is of interest to note that the brewing industry for many years has employed carbon dioxide as a preservative for beer. It is probable that this is the mere chance that the alcohol in the beer is produced by the action of bacteria on the sugars in the malt. However, the production of alcohol proceeds with the formation of carbon dioxide which is of course retained within the beverage.

A similar procedure is employed in the bottled drinks, such as Coca Cola and root beer. These are everyday applications of the principle of eliminating oxygen and employing the preservative power of carbon dioxide as a protection against oxidation and bacteriological change.

In the case of the protection of food and similar products, it is desirable to use an atmosphere very low in moisture content and high in carbon dioxide, and the presence of small amounts of carbon monoxide are advantageous from a preservative standpoint.

The factor of mechanical handling and the necessity for operators to enter the storage room determine the maximum permissible amounts of carbon monoxide in the inert gas. In any case, it is desirable to purge the storage space with air for a substantial period before operators enter the chamber.

This and numerous other factors indicate the need for close engineering supervision by those familiar with the process, before embarking on any project of this type.

Food Drying

There are many applications in which it is desirable—economically and otherwise—to dehydrate various foods. The commercial application of dehydrated foods has encountered considerable resistance, owing to changes which take place during the drying operation.

Some of the changes experienced during the moisture removal are a loss of vitamin content, change of flavor, and a marked deterioration in color.

There are many ways to overcome a portion of these difficulties, but the elimination of oxygen has an important advantage in the drying of most foods.

If oxygen is to be eliminated, the gaseous medium used for drying would normally be inert gases, which are maintained warm and low in water content.

Fig. 3 shows a typical unit employed in connection with the preparation of inert gases for the protection of foods.

IT will be evident from the abbreviated discussion above that the present application of inert gases in industry represents only a minute fraction of the possibilities which are awaiting commercial development.

Almost every industrial plant offers some application of inert gas. The inert gases will vary in composition depending on the specific application, but in practically all cases they can be made much more economically by the proper treatment of gas than by any other way.

The application of inert gases to the innumerable fields which are waiting requires a close cooperation between the industrial gas engineers and the chemists and trained engineers of the manufacturer of inert gas equipment. It is important to be sure that the best type of gas is applied in the correct manner, and in the proper quantities. The economics of each application must be carefully studied, and the health hazards, if any, must be weighed.

In many instances, the introduction of inert gas for one purpose opens fields for its application in other related fields in the same plant.

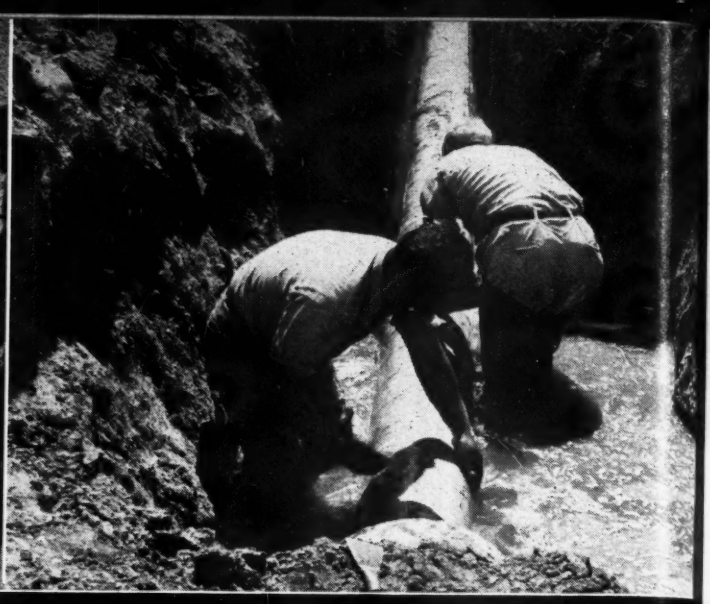
It is recommended that the study of inert gases as a means of increasing fuel gas sales be given careful attention.

It should be emphasized that the applications for inert gas which have been discussed here represent the results of an extensive development in connection with our activities in the construction of complete industrial plants and specialized equipment.

The applications are not untried, and they have a considerable background of experimental and laboratory study. Many hundreds of thousands of dollars' worth of equipment producing these inert gases is now in continuous daily successful use. Our chemists and trained engineers have made numerous successful applications.

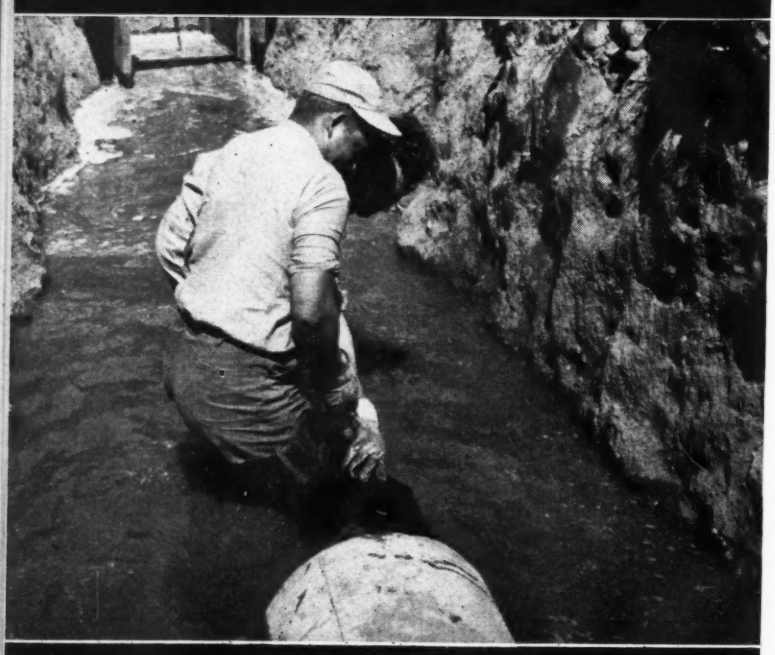
In spite of this, we believe that the field for introducing inert gases into industry has barely been scratched, and we recommend an intensive study of the applications of inert gas to industry as a fertile field for expanding industrial gas sales.

Two men stationed at the entrance, steady the pipe and guide it into the mouth of the conduit.



Debris is washed off the pipe as it starts floating through the co

Two men pull on the cable attached to the pipe as it floats through. The truck stands by.



End of the pipe noses its way into the sunlight again as the unique operation is completed.

FLOATING PIPE

Unique Method Used In Laying 12-in. Main In Conduit Under Highway

EXPERIENCE gained by a distribution engineer while serving with the "Seabees" during the war came in handy recently when the San Diego Gas & Electric Co. faced the problem of placing a 12-in. gas main under an existing highway.

Because of California State Highway specifications, it was necessary to place the gas main in a cement conduit under the Sixth Ave. approach to Mission Valley road. How to get the 12-in. pipe into the conduit without damaging the wrapping became a major problem. Recalling some of the "impossibilities" that were solved by his Seabee outfit overseas, C. W. Capwell, engineer with the gas distribution department of the utility, came up with the idea of digging a trench in front of the conduit and floating the pipe into position.

Accordingly, when the conduit was laid, a messenger wire was placed inside so that a cable could be pulled through. A trench, slightly longer than the 300-ft. length of pipe, was then excavated in front of the conduit. After the pipe had been placed in the trench, both ends were sealed, and water was turned into the trench until the pipe floated above the bottom of the conduit. Two men were stationed at the opening to steady the pipe and guide it into the conduit, while two men at the opposite end pulled the pipe through by a cable.

Distribution System Capacities

Interim report of the Distribution Capacities Sub-committee of the Technical Committee, Indiana Gas Association. Released by the committee for exclusive presentation in GAS. Much supporting data has been omitted in the interests of brevity.

THE Technical Committee of the Indiana Gas Association, assigned, on December, 1943, the subject of the effect of house heating loads upon the

Exclusive

distribution system to a sub-committee for study. It was anticipated at that time that in the postwar era, house heating would be a major problem.

The original assignment had as its objectives:

1. To be prepared to take care of the increases in house heating load, economically.
2. To determine factors relating to economics of house heating, as they pertain to the distribution systems.
3. To determine scientifically the distribution cost to supply each house heating customer, and the investment necessary to take care of different percentages of house heating load, up to 50%, and to determine the amount of capacity left in the system.

The committee believes that, at the present time, the scope is too large for immediate full treatment. In a large number of cases, the cost of serving a house heating customer is merely the cost of replacing the meter, while in other cases, the cost is very large. Similarly, some distribution systems are over-built, either as a result of specifying minimum size mains based upon "rule of thumb" practices, or because of changing to higher Btu gases, or both; however, the determination of either the cost per customer, or the system required to supply various percentages of house heating, is not impossible if fundamental data and the conditions of the present system or area are known. It resolves itself into individual studies of each distribution system. The work of this committee has been limited to determining fundamental basic data, which will be useful to the distribution engineer in planning extensions to, or improvements of, the distributing mains, or in laying out future distribution systems (future layouts). Sound distribution design means the determination of investment necessary to insure good service at the most economical figure.

These data, with additional suggestions and aids, are included in the following pages.

In using these data, the engineer should remember that certain values are the result of average conditions as they now exist. For instance, the "K" factor is simply an average amount of gas used by the house heating customers, and includes big houses, small houses, well insulated houses, and poorly insulated houses. The committee suggests that the "K" factor should be determined for the present house heating customers in the location being considered, as a guide, and a check upon the values quoted in this report. There is some evidence that as new, well insulated houses are built, the over-all "K" factor will decrease in value.

MEMBERS OF SUBCOMMITTEE

D. S. Martin, Chairman
Citizens Gas & Coke Utility, Indianapolis

E. L. Ahlering
Northern Ind. Public Serv. Co., Hammond

M. C. Hansen
Northern Ind. Public Serv. Co., Peru

L. A. Kirch
Indiana Gas and Water Corp., Indianapolis

J. M. Pickford
Northern Ind. Public Serv. Co., East Chicago

T. N. Spencer
Central Ind. Gas Co., Muncie

Gas Loads

Domestic—The first step in designing a new system, or of re-enforcing an old system, is, of course, to determine the loads to be supplied. At the present time, the primary load is the so-called domestic load, comprised of cooking, water heating, and refrigeration. The first efforts of the committee were directed at determination of the effect of each of the three major uses on the total load per customer. Lack of information of the appliances already being served, and the amount of effort required to keep such information uptodate, together with the large number of combinations possible, made this method of attack impractical. It was therefore decided to obtain data on present domestic loads without regard to appliances, in order to determine the range of values existing in different cities, and to indicate an approximate value to be used. These values obtained for a maximum load—deducting, so far as possible, all house heating, industrial, and commercial loads—showed a range of from 4400 Btu per customer to 9500 Btu per customer, per hour. The committee suggests that, where more definite data is not available, 8000 Btu per customer, per hour be used. See *Table 1* for details.

House Heating — The individual house heating load can vary over a wide range and it is impossible to assign, in advance, a figure to an individual case. What size houses will be built and how well insulated they will be is very difficult to predict. Calculations in *Table 2* indicate that the house heating load is twice the domestic load with 20% house heating saturation, increasing to six times the domestic load for 100% house heating saturation. As a guide in estimating the average load per customer, the house heating loads in a number of localities were analyzed. In order to eliminate the effect of variations caused by different calorific gases and differences

TABLE 1. DOMESTIC LOADS

Locality	No. of Meters	No. of Heating Customers	Date of Maximum Hr. Test	Temp. During Max. Hr.	Domestic Consumption Per Meter* Btu Per Hr.
Dunkirk	492	23	Sept. 25, 1944	70°	7260
Hartford City	1184	3	Nov. 23, 1944	38°	7150
Gas City	634	5	Nov. 23, 1944	38°	8430
Jonesboro	258	0	Sept. 25, 1944	70°	7960
Alexandria	961	19	Sept. 25, 1944	70°	9500 (a)
Edinburg	337	....	Sept. 25, 1944	74°	6710
Attica	960	....	Sept. 25, 1944	74°	5880
Franklin	1005	....	Sept. 25, 1944	74°	6660
Noblesville	1573	....	Sept. 25, 1944	74°	6760
New Castle	3901	305	Nov. 23, 1944	37°	7550
Winamac	403	18	Nov. 23, 1944	35°	6910
Wabash	2200	....	Nov. 23, 1944	35°	6760
Peru	2818	....	Nov. 23, 1944	35°	6150
Logansport	5056(a)	....	Nov. 23, 1944	35°	6050
Valpariso	2735	65	Oct. 9, 1944	48°	4440*(b)
Bluffton	1343	61	Nov. 23, 1944	35°	7850
Warsaw	1412	7	Nov. 23, 1944	35°	5650
Hobart	3033	50	Nov. 23, 1944	35°	6600
Berkley Road Indianapolis	112(b)	10	Nov. 23 1944	38°	6360
TOTAL	30417			AVERAGE	6870

(a) Highest
(b) Lowest
(*) House heating and industrial loads not included. These figures represent the highest of the tests where more than one test was made.

TABLE 3. TABLE OF HOUSE HEATING LOADS

(The following data was obtained from Gas Consumption Records)

LOCATION	*NO. OF HEATING CUSTOMERS*	*"K" FACTOR*
Edinburg		.303
Attica		.303
Franklin		.303
Noblesville		.303
New Castle	305	.280
Winamac	18	.344—.288
Wabash		.288
Peru		.400 (a)
Logansport		.246—.295
Berkley Road, Indianapolis	10	.300
Fort Wayne	2152	.205
South Bend (1)	250	.143 (b)
South Bend (2)	372	.232
South Bend (3)	622	.197
Hammond	788	.243—.268
	AVERAGE	.288

(1) Small homes project
(2) Other than small homes project.
(3) Entire city.
(a) Highest
(Includes high percentage of commercial space heating.)
(b) Lowest
(All small homes)

TABLE 2. CALCULATION OF AREA LOAD

(In order to illustrate the use of the foregoing data, the following examples are presented.)

Example 1 "K" FACTOR METHOD

400 houses probable.
20% house heating (estimated).
Type and size not known.
No commercial nor industrial loads.
1000-Btu gas.
—10° F. Design basis.
"K" factor for balance of town .25
(Domestic usage deducted).
Use from *Fig. 1* for .25 therms and;
1000-Btu gas, 78 C. F.
8000-Btu for domestic use per customer

Domestic Usage:

$\frac{400 \times 8000}{1000}$ = 3200 C.F. per hour

House Heating:

400x.20x78 = 6240 C. F. per hour

TOTAL 9440 C. F. per hour

(Note that the house heating load is almost twice the demand caused by the domestic load).

Example 2 HEAT LOSS METHOD

250 houses to be built as a unit.
All house heating.
40,000 Btu per hour heat loss based on a design of —10° F. (75° temp. diff.)
570-Btu gas.
75% Heater efficiency
8000 Btu for domestic use per customer

Domestic Usage:

$\frac{250 \times 8000}{570}$ = 3510 C. F. per hour

House Heating:

$\frac{250 \times 40000}{.75 \times 570}$ = 23400 C. F. per hour

TOTAL 26910 C. F. per hour

(Note that with houses having such a small heat loss as 40000 Btu per hour, the house heating load is over six times the domestic load).

The "K" factor for this group of houses would be:

$\frac{40000 \times 24 \text{ Hours}}{.75 \times 100000 \times 75}$ = .17 Therms

in minimum temperatures, and to permit computation from monthly bills, the loads were calculated to a basis of therms per average customer, per degree day.* This factor was labeled "K" factor and was found to vary from .143 to .400, excluding the domestic usage of the house heating customer. See *Table 3* for tabulation of various "K" factors determined.

This "K" factor, converted to cubic feet per hour, per customer, for different design temperatures, is shown in *Fig. 1.* (For derivation, see *Table 4).* The committee suggests that, where information on a particular area is not available, a "K" valve of .3 be used. This corresponds to a load of 165 cu.

* A unit based upon temperature difference and time, used in specifying the nominal heating load in winter. For any one day there exists as many degree days as there are degrees Fahrenheit difference in temperature between the mean temperature for the day and 65° F., when the mean temperature for the day is below 65° F.

For example:

	Case 1	*Case 2*	*Case 3*
24-Hr. High	0°	50°	75°
24-Hr. Low	—10°	30°	55°
24-Hr. Mean	— 5°	40°	65°
Degree Days	70	25	0

TABLE 4. DERIVATION AND USE OF CHART FOR ESTIMATING HOUSE HEATING LOADS

DERIVATION OF FIG. 1

The purpose of this chart is to supply a convenient means of converting selected "K" factors and design temperatures into terms of cubic feet per hour for gases having a heating value of 570 and 1000 Btu per cubic foot. The chart is derived from the following formula, by which values for conditions not covered by the chart may also be determined:

$$C = \frac{K \times 100{,}000 \times (65-T)}{Btu \times 24}$$

Where:

C = Heating Load—cu. ft. of gas per customer per hour.

K = "K" Factor (therms per customer per degree day).

100,000 = Btu per therm.

T = Outside temperature

65 = Degree day base temperature—Fahrenheit.

Btu = Number of Btu per cu. ft. of gas (heating value).

24 = Number of hours per day.

DESIGN TEMPERATURE

The question of selecting the design temperature for estimating house heating loads for system capacity analysis is of a problematical nature. Extreme conservatism would dictate the use of the lowest recorded temperature of the locality; however, the American Society of Heating and Ventilating Engineers recommend a somewhat higher temperature than this in estimating design heat loss of buildings. The reasons are stated quite clearly in the current edition of their "Guide." From the Design Temperature Zone Map in the "Guide," all of Indiana north of an East-West line, approximately 50 miles south of Indianapolis, is in the —10° F. Zone, that part of the state south of this line being in the 0° F. Zone.

ft. of 570 Btu gas per hour, or a load of 94 cu. ft. of 1000 Btu gas per hour, per customer, for a design temperature of -10°F. See *Tables 5 and 6* for details of determination of "K" factors.

Industrial and Commercial

Industrial—Industrial customers located in an area containing an appreciable amount of house heating will probably be very few. The individual load will be known accurately, so no average values were determined. Where an industrial customer is located in an area containing house heating loads, it will have to be given special consideration.

Commercial—Commercial customers usually occur in the business or non-house-heating areas. The committee suggests that commercial space heating be included as a domestic house heating customer and be included in the determination of the load data used.

TABLE 5. METHODS FOR DETERMINING "K" FACTORS

The two methods for determining "K" Factor for any particular locality which were found to give reliable results and are relatively simple in application are as follows:

METHOD NO. 1

a. From the accounting report, obtain the total consumption in therms per house heating customer, for the locality in question, for the entire heating season. (Generally Sept. 1 to June 1).

b. Likewise determine the average domestic consumption in therms, per customer, for same period.

c. Determine the house heating consumption, per house heating customer, for the heating season, by subtracting the average domestic consumption for the heating season, from total consumption per house heating customer.

d. The "K" factor is the quotient obtained by dividing the number of therms house heating consumption, per customer, per heating season, by the total number of degree days for that season.

METHOD NO. 2

a. Determine the total consumption of the residential house heating customers, for a mid-winter billing period, from route books, and convert to therms.

b. From the total therms obtained as above, subtract the average monthly consumption (domestic) in therms for July and August, for the same customers.

c. Determine a divisor, which is the total number of house heating customers multiplied by the number of degree days in the mid-winter billing period. If more than one billing period is involved, the divisor is the sum of the products of the number of house heating customers, and the degree days for each billing period.

d. The "K" Factor is the quotient obtained by dividing the total therms heating consumption (b) by the divisor (c):

b ÷ c = "K"

(Note: Method No. 1 involves much less work than Method No. 2.)

TABLE 6. EXAMPLE OF DETERMINATION OF "K" FACTOR BY METHOD NO. 1

		FROM ACCOUNTING REPORT					
		Therms Per Customer					
Month	*Year*	*Home Htg. & Domest'c*	*Avg. Domestic*	*Net Home Heating*	*No. of Home Htg. Customers*	*Degree Days*	*"K" Factor*
				(1 - 2)			(3 ÷ 5)
Sept.	1943	31.6	12.6	19.0	868	167	.114
Oct.	1943	82.9	13.6	69.3	869	363	.191
Nov.	1943	144.3	11.8	132.5	861	863	.154
Dec.	1943	236.7	11.6	225.1	871	1163	.193
Jan.	1944	312.6	11.6	301.0	866	1041	.288
Feb.	1944	289.0	11.4	277.6	873	1044	.265
March	1944	288.4	13.8	274.6	862	1014	.271
April	1944	267.0	12.0	255.0	864	590	.432
May	1944	171.6	14.1	157.5	864	136	1.157
TOTAL		1824.1	112.5	1711.6	7798	6381	....
AVERAGE		....	....	....	867	....	.268

Tabulation taken from the records for the City of Hammond, Ind., and is used to illustrate the application of Method No. 1.

The "K" Factor to be used as determined from the above data is $\frac{1711.6}{6381} = .268$

The "K" Factor for each month is shown to illustrate the lack of uniformity of the factor for short periods and the necessity of determining the "K" Factor from an entire heating season if reliable results are to be obtained.

Comparing the "K" Factor obtained by the above method with that obtained by Method No. 2, please note that the latter method gave a factor which is 9% less than Method No. 1, as shown by the weighted average line of the graph shown in Fig. 8.

Diversity

Before using a diversity factor, a strict definition of the word should be agreed upon. The committee agreed to use the definition: "Diversity is the relationship of the amount of gas used at any one time by a group of appliances, to the maximum amount of gas these same appliances would have used, had all of them been burning at the same time the full amount of gas for which they were adjusted." (See *Tables 7 and 8*).

An article "House Heating Diversity" by H. L. Robbins and Newton Croll, published in "American Gas Association Monthly," February, 1945, was studied, and some correspondence with the authors was had. The results of this study, made on four different locations, together with a large number of observations, indicate that where 60 or more house heating customers are involved, the diversity factor is the reciprocal of the "pick-up" factor. ("Pick-Up" factor is expressed as the percentage by which the heater output exceeds the heat loss of the house for the designed temperature). In other words, the maximum demand is simply the amount of gas needed to supply the heat losses of the houses. This observation was approximately correct on the one test area observed, even though the number of house heating customers was only 10.

If the prospective load is to be estimated by the use of "K" factors, the diversity factor may be eliminated. Since the "K" factor, determined from customers already being served in the same town, is the amount of gas required to supply the heat losses, there is no need to introduce a "pick-up" factor and then to use a diversity factor.

Where a group of houses designed for gas heating are erected as a group, or at the same time, the committee recommends that the total heat loss, divided by the estimated over-all heating efficiency, be used, instead of using the average figure as determined by the "K" factor. Such "housing projects" or group construction, often vary considerably from the average of the entire town. In South Bend, Ind., one war housing project had a "K" factor of almost 39% less than that of the entire city.

A "K" factor formula, where undetermined by test, may be derived from the following formula:

$$K = \frac{E \times 100{,}000 \text{ Btu/Therm} \times D}{H \times 24 \text{ Hours Per Day}}$$

Where:

K = "K" Factor.

H = Hourly heat loss of average house involved at the design outdoor temperature expressed in Btu.

E = Average efficiency expressed as a ratio of

$$\frac{\text{Btu delivered to the house as useful heat}}{\text{Btu Input}}$$

(E may be assumed to be 0.75)

D = Degree day deficiency at design temperature (for —10° F. this would be 75).

TABLE 7. EVALUATION OF THE DIVERSITY FACTOR

No extensive tests were made by the committee on the problem of diversity factors; however, quite extensive tests made by the Philadelphia Gas Works Co., were reported by H. L. Robbins and Newton Croll of that company in the February, 1945, issue of the "American Gas Association Monthly." The results of these tests, which cover four house heating groups totaling 1272 customers, are shown in re-tabulated form on the following page.

The figures contained in this tabulation show that the actual gas demand, where the pick-up factor[1] is not excessive, is the sum total of the amount of gas required to supply the heat losses[2] of all the houses in the group, even though the heater outputs exceed the heat losses of the houses.

[1] The pick-up factor is expressed as the percentage by which the heater output exceeds the building heat loss at design temperature conditions, or may be considered as the actual Btu input of the burner divided by the burner input required to supply the heat losses at design temperature conditions.

[2] The term "Heat Losses", as used herein, consists of flue loss, radiation losses from heating plant, and heating system, and the loss from the building to the outside air. "Output" is considered as Btu burner input less Btu heat loss through flue, and by radiation from heating plant and system.

TABLE 8. TABULATION OF HOUSE HEATING DIVERSITY

SITE	PICK-UP FACTOR[1]	DIVERSITY (APPLIANCE FACTOR)	2 x 3 ACTUAL HEAT SUPPLIED	HEAT LOSS FACTOR	4 ÷ 5 HEAT LOSS DIVERSITY	REMARKS
A						2. Value as shown on Chart 3. Actual burner input divided by burner input required to supply heat losses at design maximum.
0°	1.84	.63	1.16	1.00	1.16	
5°	1.84	.58	1.07	.93	1.15	
10°	1.84	.53	.98	.86	1.13	
15°	1.84	.49	.90	.785	1.14	
20°	1.84	.45	.83	.715	1.16	
25°	1.84	.40	.74	.643	1.15	
B						3. From Chart 3. Diversity as defined on Page 63. See Page 5 of report.
0°	1.47	.68	1.00	1.00	1.00	
5°	1.47	.63	.93	.93	1.00	
10°	1.47	.58	.85	.86	.99	
15°	1.47	.53	.78	.79	1.00	
20°	1.47	.48	.71	.72	.99	
25°	1.47	.43	.63	.64	.98	
C						4. Ratio of heat supplied by the burner in a unit of time to that required at design maximum.
0°	1.31	.77	1.01	1.00	1.01	
5°	1.31	.71	.93	.93	1.00	
10°	1.31	.65	.85	.86	.99	
15°	1.31	.59	.77	.79	.98	
20°	1.31	.54	.71	.72	.99	
25°	1.31	.48	.63	.64	.98	
D						5. Ratio of actual temperature difference to maximum design temperature difference. Example for 10°, Factor = 70— 0 / 70—10 = .858
0°	.90	1.05[2]	.95	1.00	.95	
3°	.90	1.00	.90	.95	.95	
5°	.90	.97	.87	.93	.94	
10°	.90	.89	.80	.86	.93	
15°	.90	.82	.74	.79	.94	
20°	.90	.74	.67	.72	.93	
25°	.90	.66	.59	.64	.92	

[1] Based on heat loss at 0°—70°

[2] This is an impossibility in actual practice. The heaters in group D will not maintain 70° inside when the outside temperature is below 3° F.

Calculations of "Heat Loss Diversity" from data on Chart 3, page 65, "American Gas Association Monthly" for February, 1945.

6. Ratio of actual burner input to theoretical burner input required.

Distribution Design

It is, of course, not intended that this report include a full discussion of all the various phases of distribution design, but the committee wished to present some data and ideas which may be of service to the distribution engineer.

Present System—A fairly large proportion of the future house heating load will probably be added on to the present low pressure distribution mains. To many it will be a pleasant heating load. Many distribution systems will supply a fairly large house heating load. Many distribution sysstems have much greater capacity than was required for cooking, water heating, and refrigeration loads. In addition to this, the changing over to higher Btu gases has further increased the thermal capacity; but, where the load has increased beyond the capacity of the present mains, it is suggested that the following methods of increasing the capacity be considered:

a. The use of solvents to remove deposits from the mains, where type of joints permits.

b. The use of boosting-type, low pressure district regulators. Included in this type of regulator are those having time and temperature loading controls which are particularly applicable to house heating loads. Peak loads at low outside temperatures are thus provided for, as well as periodic loads not related to temperature conditions. In this latter category belong the morning "pick-up" and meal-time loads. An added advantage of the time-temperature loaded regulator is in its performance characterstics. Load "hogging" is entirely eliminated in sections supplied through more than one regulator.

c. The conversion to intermediate pressure where joints and service connections permit.

d. Addition of more district regulators.

e. Looping of districts.

New Installations—Expansion of the house heating load introduces distribution system design problems which require careful consideration. There are judgment factors involved, such as anticipating the degree of home heating saturation of any particular locality, and the extent and direction of building expansion. A wrong guess on such questions could upset otherwise well laid plans on distribution system design. Here exists the risk of either over-sizing the system, with consequent unnecessary investment costs, or under-sizing, which will lead to operating difficulties and costly corrective measures.

On preceding pages, data are presented for estimating distribution system loads when the number of consumers is known; *Figs. 1 to 5*, inclusive, give the graphical solutions to common design problems which would otherwise require a tedious process of computation. See *Table 9* for derivation of *Figs. 2 to 5*.

The diagram on *Fig. 6* illustrates a layout of a typical gridiron pattern for a square mile of distribution system. A pattern such as the one shown has limitations imposed by topography. Rivers, lakes, railroads and parks may confine parts of a distribution system to irregular patterns which require special treatment in design.

A graphical analysis of the cost-capacity ratio of mains of various sizes is shown on *Fig 7*. It may be noted that the cost per unit capacity is progressively less as the size of the main is increased. To illustrate: A system composed entirely of 3-in. mains would cost approximately 3½ times as much as a system composed of 6-in. mains

TABLE 9. PERMISSIBLE LENGTHS OF DISTRIBUTION RUNS, DERIVATION OF CURVES

The curves on Figs. 2 to 5 inclusive, showing permissible length of distribution runs for various pressure drops and loads, were constructed from the Modified Spitzglass Gas Flow formulas:

(1) For Low Pressure

$$Q = 3500\,K\sqrt{\frac{h}{S\,L}} \times R$$

(2) For High Pressure

$$Q = 4830\,K\sqrt{\frac{Pa}{S\,L}} \times R$$

Where
Q = Total load or quantity of gas entering main, std. cu. ft. per hour.
K = Spitzglass constant.
h = Pressure drop between pipe terminals, inches of water column.
P = Pressure drop between pipe terminals, lb. per sq. in.
a = Average pressure in pipe line, lb. per sq. in. absolute (absolute initial pressure minus ½ the pressure drop).
S = Specific gravity of the gas.
L = Length of pipe, feet.

$$R = \sqrt{\frac{6n^2}{(N+1)(2n+1)}}$$, where n = number of services.

(3)

$$Q = \frac{L\,b}{d}$$

Where:
b = Load per customer (cu. ft. per hour).
d = Distance between services in feet.

Substituting:

$$\frac{L\,b}{d} = 3550\,K\sqrt{\frac{h}{S\,L}}\,R$$

Transposing and clearing the equation:

$$(4)\quad L = 233 \times K^{2/3} \times R^{2/3} \times \left(\frac{d}{b}\right)^{2/3} \times \left(\frac{1^{1/3}}{S} \times h^{1/3}\right)$$

SOLVING FOR L:

Given the following conditions:
2-in. main
40-ft. lots = Distance between services (d)
8 cu. ft. gas per customer per hour (b)
2-in. water column, allowable pressure drop.
.65 = specific gravity of the gas.

Then:

$$K^{2/3} = 3.675^{2/3} = 2.382$$
$$\frac{(d)^{2/3}}{(b)} = \frac{40^{2/3}}{8} = 5^{2/3} = 2.925$$
$$h^{1/3} = 2^{1/3} = 1.260$$
$$\left(\frac{1}{S}\right)^{1/3} = 1.155$$

Substituting in Formula (4):

$$L = 233 \times 2.382 \times R^{2/3} \times 2.925 \times 1.155 \times 1.260$$
$$L = 2360 \times R^{2/3}$$

Assume $L = 2000$

Then $n = \frac{2000}{40} = 50$

Therefore: $R^{2/3} = 1.427$

and $L = 2360 \times 1.427 = 3370$ No. of ft. permissible length of main for above conditions.

$n = \frac{3370}{40} = 84$

Corrected: $R^{2/3} = 1.434$

and $L = 2360 \times 1.434 = 3380$ ft. corrected No. of ft. permissible length of main for above conditions.

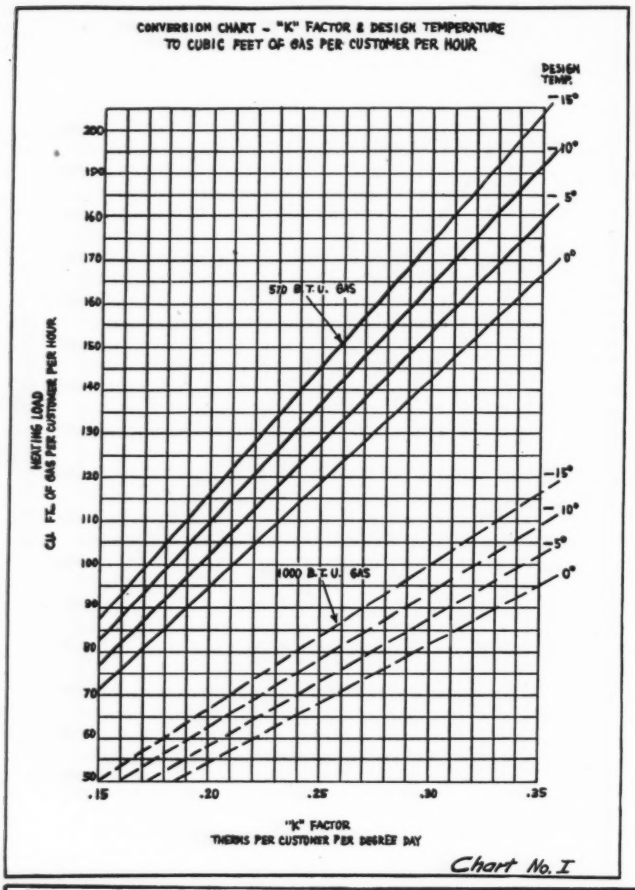
Proving the value of R as found above:

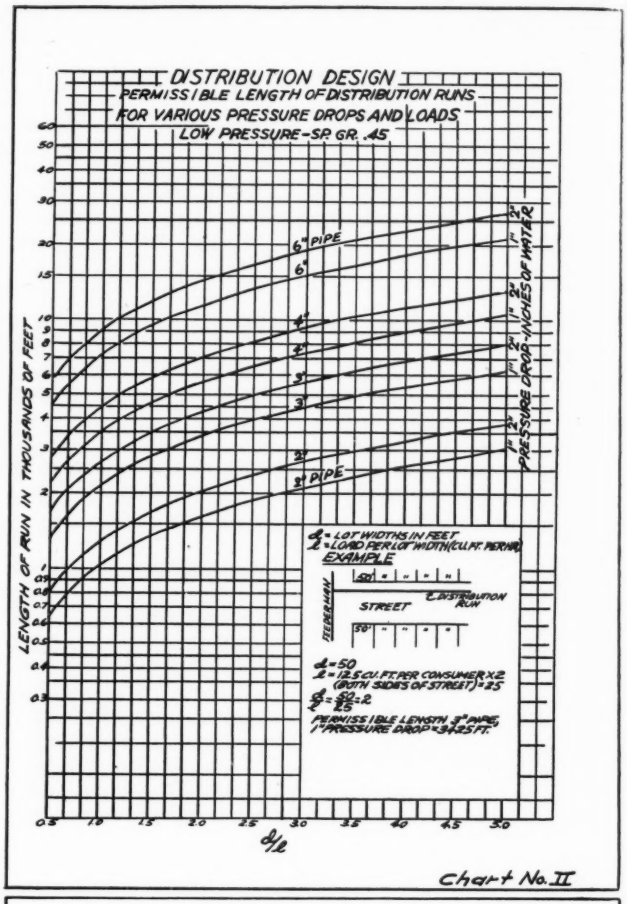
$n = \frac{3380}{40} = 84.$

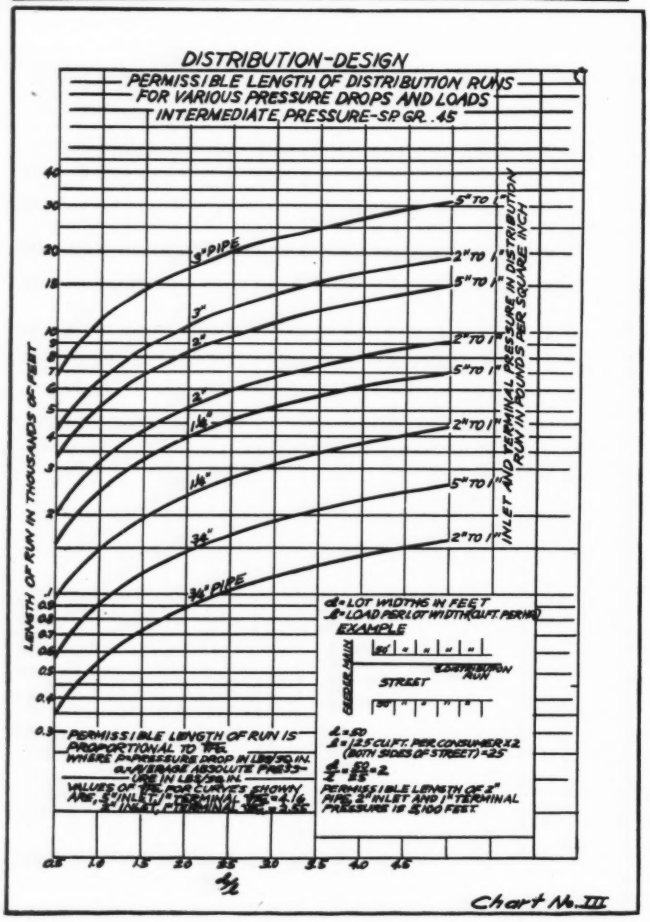
Therefore $R = 1.72$ and $R^{2/3} = 1.435$.

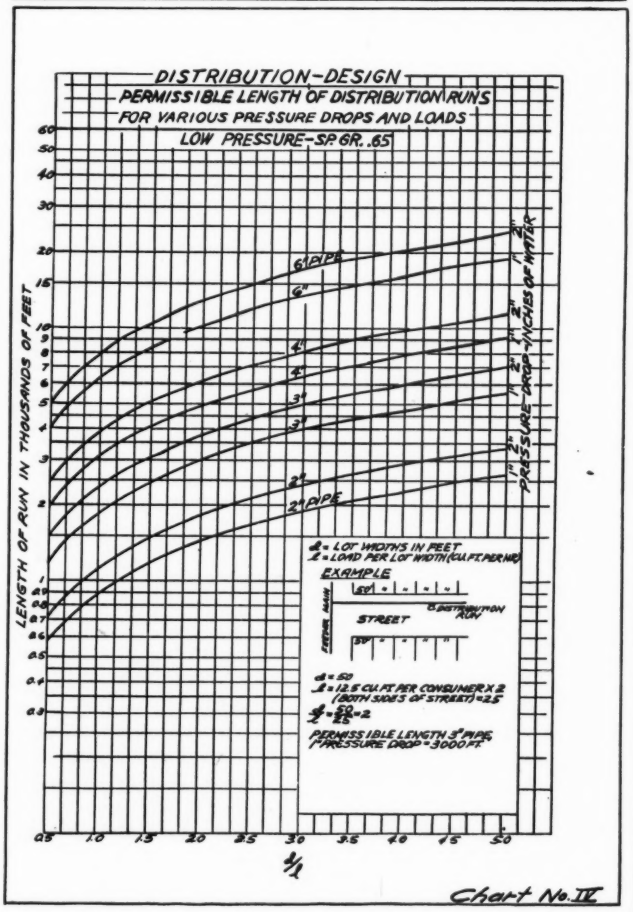
The value of $R^{2/3}$ is in agreement with solution and therefore the value of L is correct.

The same process as used above was repeated for various pipe sizes and pressure drops. Curves were constructed for specific gravities of .45 and .65 for both low and intermediate pressure.


CONVERSION CHART - "K" FACTOR & DESIGN TEMPERATURE
TO CUBIC FEET OF GAS PER CUSTOMER PER HOUR
DESIGN TEMP.
HEATING LOAD
CU. FT. OF GAS PER CUSTOMER PER HOUR
510 B.T.U. GAS
1000 B.T.U. GAS
"K" FACTOR
THERMS PER CUSTOMER PER DEGREE DAY
Chart No. I




DISTRIBUTION-DESIGN
PERMISSIBLE LENGTH OF DISTRIBUTION RUNS
FOR VARIOUS PRESSURE DROPS AND LOADS
INTERMEDIATE PRESSURE-SP. GR. .45
LENGTH OF RUN IN THOUSANDS OF FEET
INLET AND TERMINAL PRESSURE IN DISTRIBUTION RUN IN POUNDS PER SQUARE INCH
EXAMPLE
STREET
Chart No. III



Figs. 1 to 4. Graphic solutions of common design problems. See Table 4 for derivation of Fig. 1. See Table 9 for derivation of Figs. 2 to 4.

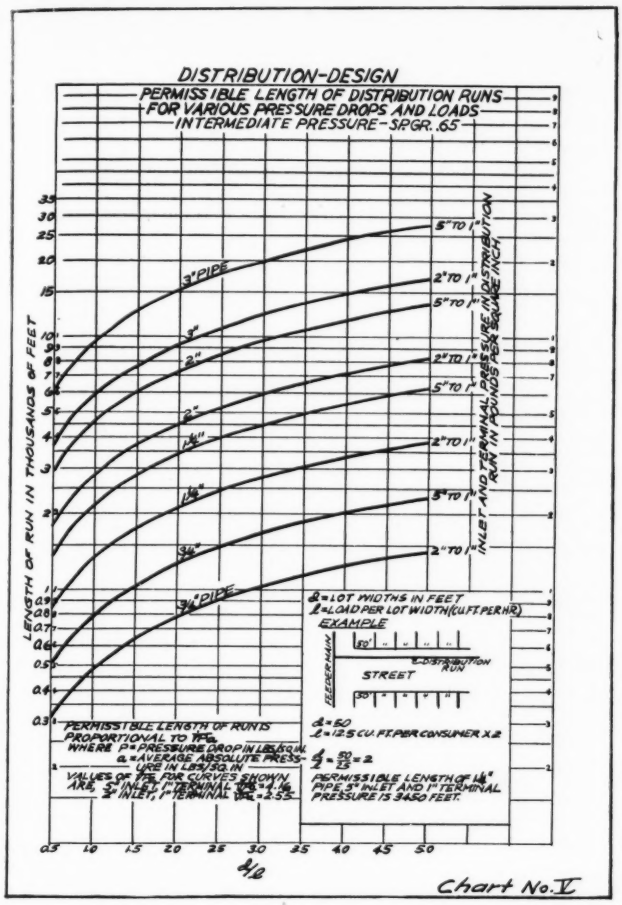


Fig. 5. Graphic solution of design problem. See Table 9 for derivation.

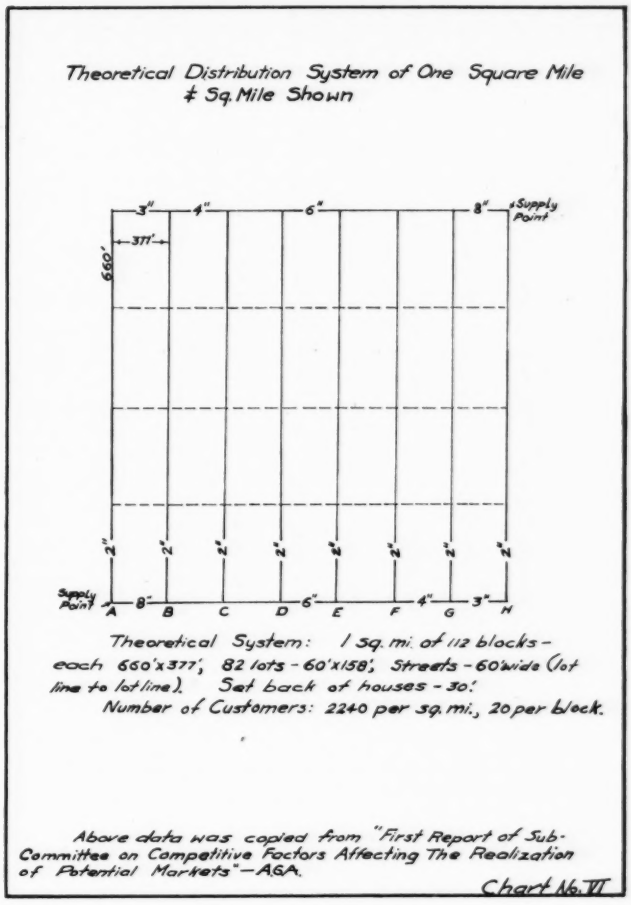

Theoretical Distribution System of One Square Mile
¼ Sq. Mile Shown
Supply Point
660'
377'
Supply Point
Theoretical System: 1 sq. mi. of 112 blocks - each 660'x377', 82 lots - 60'x158', Streets - 60' wide (lot line to lot line). Set back of houses - 30'.
Number of Customers: 2240 per sq. mi., 20 per block.
Above data was copied from "First Report of Sub-Committee on Competitive Factors Affecting The Realization of Potential Markets" - A.G.A.
Chart No. VI

Fig. 6. A theoretical distribution system of one square mile, presenting ¼-mile section.

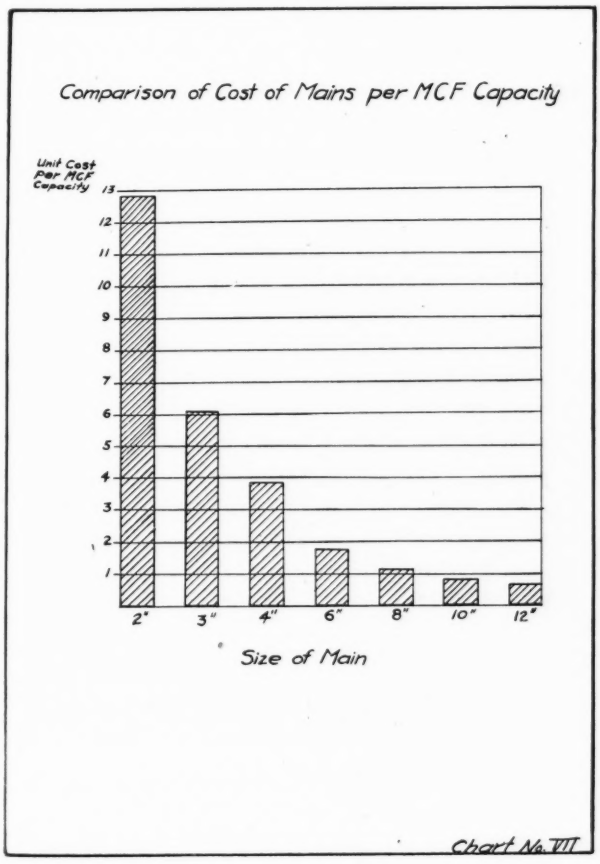


Fig. 7 (at left). A graphic analysis of the cost-capacity ratio of mains of various sizes. Note that cost per unit capacity is progressively less as the size of the main increases. For example, in comparing 3- with 6-in. mains, it is found that use of the smaller mains would cost approximately three times as much as with the larger size.

Fig. 8. Chart of househeating "K" factor in Hammond, Ind., during 1943-44 season shows uniformity of the factor during the cold months.

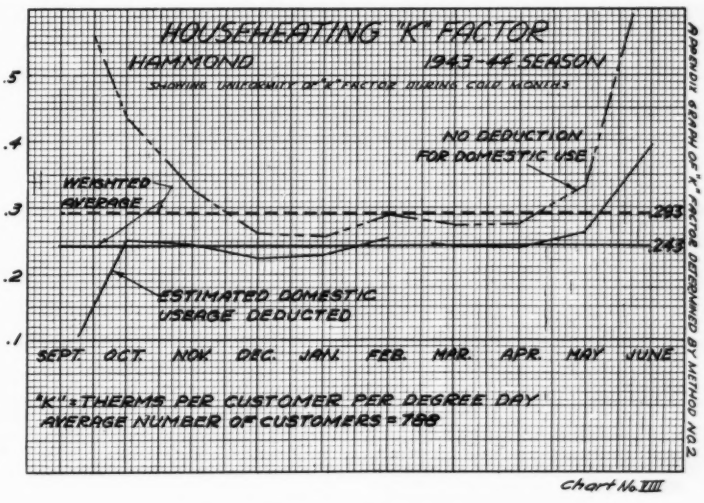

HOUSEHEATING "K" FACTOR
HAMMOND 1943-44 SEASON
SHOWING UNIFORMITY OF "K" FACTOR DURING COLD MONTHS
NO DEDUCTION FOR DOMESTIC USE
WEIGHTED AVERAGE
.293
.243
ESTIMATED DOMESTIC USEAGE DEDUCTED
SEPT. OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE
"K" = THERMS PER CUSTOMER PER DEGREE DAY
AVERAGE NUMBER OF CUSTOMERS = 789
APPENDIX GRAPH OF "K" FACTOR DETERMINED BY METHOD NO. 2
Chart No. VIII

TABLE 10. PIPE—EQUIVALENT LENGTHS CONVERSION TABLE FOR FLOW COMPUTATIONS

Given Nominal Size	*EQUIVALENT LENGTH OF PIPE ¾ IN. TO 24 IN. (NOMINAL SIZE)*												
	1	1¼	1½	2	3	4	6	8	10	12	16	20	24
¾	3.72	16.1	36.55	138.5	1253.	6106.							
1	1.0	4.317	9.83	37.23	337.0	1642.	13233.						
1¼		1.0	2.28	8.625	78.1	380.0	3065.	12333.					
1½			1.0	3.788	34.28	167.0	1346.	5855.	19382.				
2				1.0	9.05	44.1	355.	1544.	5112.	13206.			
3					1.0	4.87	39.26	170.8	565.	1460.	5127.		
4						1.0	8.51	35.07	115.9	300.0	1052.7	3520.	
6							1.0	4.35	14.39	37.2	130.6	436.8	1151.8
8								1.0	3.31	8.55	30.0	100.4	264.6
10									1.0	2.59	9.08	30.3	80.0
12										1.0	3.51	11.73	30.9
16											1.0	3.34	8.82
20												1.0	2.64

In computing flows or pressure drops in a line containing pipe of various diameters it is often desirable, for ease of computation, to convert the line into the equivalent length of a pipe having the same diameter throughout. The above table gives the values for these conversions. Example:

Given 1 Mile of 4 in. 1 Mile of 3 in.

From the table above 1 unit of 3 in. pipe is equivalent to 4.87 units of 4 in. pipe.

Equivalent 4 in. Main

$$1 + 1 \times 4.87 = 5.87 \text{ Miles}$$

Equivalent 3 in. Main

$$\frac{1}{4.87} + 1 = 1.205 \text{ Miles}$$

Table is based on Weymouth Formula for average internal diameters. For transmission lines of known internal diameters use ratio calculated according to the formula:

$$L_1 = L \times \frac{D_1^{5\frac{1}{3}}}{D^{5\frac{1}{3}}}$$

having equal capacity.

Time-temperature loaded regulators may be used to advantage in areas having heavy house heating loads. Often the design of the distribution system may be modified thereby and the cost of this type of regulator off-set by the savings made, not to mention the improved operating conditions possible.

Table 10 shows equivalent pipe lengths, in the form of a conversion table, for flow computations.

Trunkline Gas Supply Seeks Authority To Build $74 Million, 30-Inch Line

The Trunkline Gas Supply Co., Wilmington, Del., and Washington, D.C., has requested FPC authority to construct and operate a 30-in. natural gas line from Wharton county, Texas, through Arkansas and Missouri to Keokuk, Iowa, a distance of about 855 miles. Cost has been estimated at $74-266,507. The company plans to begin construction as soon as materials become available and estimates that the facilities would then be installed within a year.

Service proposed is wholesale service which would be offered to existing or proposed natural gas companies whose facilities lie along the route of the line. These include Natural Gas Pipeline Co. of America, Northern Natural Gas Co., Michigan-Wisconsin Pipe Line Co., Panhandle Eastern Pipe Line Co., Cities Service Gas Co., Arkansas-Louisiana Gas Co., Arkansas Oklahoma Gas Co., Mississippi River Fuel Corp., and Arkansas-Western Gas Co.

Trunkline proposes primarly to provide to these firms, and to others of the same character, supplies of natural gas in addition to their already available supplies at points of delivery convenient to them. The objective, according to the company, is to aid in alleviating the natural gas shortage existing since the war in the areas served by these companies.

NACE Initiates Two Awards

The National Association of Corrosion Engineers has established two annual awards to be made in recognition of outstanding contributions in science and engineering as pertains to the field of corrosion. These awards, to be known as the Willis Rodney Whitney Award in Science of Corrosion, and the Frank Newman Speller Award in Corrosion Engineering, were to be presented for the first time during the Annual NACE Corrosion Conference at the Palmer House in Chicago, April 7-10.

Appropriately, the first recipients of these newly established awards were the men whose names they will commemorate and perpetuate. Dr. Whitney was honored for his fundamental work in the field of corrosion through his establishment of the electro-chemical theory in corrosion, while Dr. Speller was given recognition for his application of fundamental studies to practical engineering problems.

Home Service In The "New Era"

Abridgements of five papers presented at A.G.A. Home Service Workshop, Cincinnati, Ohio, Jan. 20-23.

NOT long ago a rather pat slogan was being passed around within our industry. Among other places, I remember seeing it in A.G.A. headquarters a year or so ago and it read "*If it doesn't help to sell gas, forget it!*" I think we of the Residential Gas Section might well adopt it for our motto as we go into this highly competitive postwar era, except that there might be danger in it if misinterpreted or misused. I would prefer to paraphrase it this way, putting it in positive terms, "*If it helps to sell gas, back it to the limit.*"

To my way of thinking the original offers too many opportunities for the unimaginative or the too factual manager to prove that certain activities by their subtle or indirect place in the sales picture are not making the cash register ring, are costly and therefore should be curtailed or even abandoned.

Now I hope that you are in accord with me so far because I am sure you agree that there is no more important aid to the selling of gas than home service. Yet, if it is fulfilling its proper function, home service is certainly on the subtle side in its approach to direct sales.

If my diagnosis is correct, home service has gone through two important eras and is now well into the third.

In the initial stage the industry had to start somewhere. It was a big step for the old-line gas utility to install a home service department in any form. We weren't entirely sure of what we wanted except that it was realized that a better contact with the women of the community was necessary and that it must be done in a high-caste, dignified manner. So we sought the schools and universities for personnel. We are still seeking them today and will be tomorrow. But too often the high plane became a pedestal which was out of reach of not only mortal man but, more important, the average woman. In other words, we were talking *down* to our people, which is the greatest of sins—at least for a public utility.

In the 1930's came the great depression and with it for the first time a full realization of the importance of sales. It was along about this time that home service entered its second era. We became fully cognizant of the sales value of the home service department and admonished the women to get off their high-horse and get in there and pitch for appliance sales. So home service did—and in most cases magnificently.

Now we swing into the third era and it is in this one that I think home service really comes into its own. The adaptability and versatility of Home Service departments and Home Service people was proven beyond any shadow of a doubt during the war years, when nutrition centers, war cookery classes, information bureaus, Red Cross training programs, and a host of other activities were operated so efficiently and pleasantly that whole communities seemed to look to their gas companies for vital information, assistance and even recreation. By its very magnanimity it became the greatest instrument of good will and proper public relations any public utility could wish for. It is a blend of this spirit with that of the second era of frantic selling that will find home service at its very best in this new era of today and tomorrow. The very name is slogan enough—*Home* and *Service*.

Home service is that important link with the customer that expresses to her or to him our sincere desire to be of service. As such it is one of the finest of sales instruments but always to be most effective it should keep the order pad itself just out of the customer's sight.

The New Freedom Gas Kitchen program is such a natural for Home Service that you are taking it in stride. You have recognized it as one of the greatest selling tools ever developed by the gas industry.

Just let me sound one word of warning. This new era combines the best in both of those previous to it. But if ever there is a choice, lean a little harder in the policy side of the second era—on the real selling side. It would be very easy in this astounding maze of activity to take the wrong tack—to become so fascinated with the theory of kitchen planning, work space, cabinets, ventilation, gadgets and what not that one would neglect to include the best type of gas range and gas refrigerator that the customer can afford.

If some of the equipment happens to use electricity—so what, if it helps to sell gas? I am referring to automatic laundrys—dish washers—mixers—and the like—our allied lines which don't burn gas but assist in building the gas load. Whatever has to do with kitchens, let's have her think of the gas company and the gas appliance dealer as *the* authority.

1947 finds us only part way on the road to recovery though it is now nearly two years since V-E Day. The sellers' market may be over—and thank heaven for that—but the buyers' market can hardly begin until quality merchandise is produced in sufficient quantity to give the discriminating buyer a choice. But there is every reason to be encouraged and every reason to feel that 1947 will be a year of real progress.

In addition to the Managing Committee, there are 12 operating committees of the A.G.A. Residential Gas Section that are working with Home Service. Let me name them: Appliance Financing Committee, Dealer Relations Committee, Domestic Range Committee, Home Service Committee, Committee On Housing, House Heating and Air Conditioning Committee, Committee on Improving Domestic Gas Appliances, New Freedom Gas Kitchen Committee, Refrigeration Committee, Committee on Selection and Training of Sales Personnel, Water Heating Committee, and the Window and Store Display Committee.

W. M. CHAMBERLAIN
Michigan Consolidated Gas Co.

"Fourth Zone" Steam Oven

THE 4th Zone Steam Oven now brings to the homemakers of America the same freedom from pot watching and the same sureness of uniform results in vegetable cooking that the invention of the oven temperature control gave to the homemaker for baking.

The picture is now complete, because with the addition of the 4th cooking zone to the other three zones—surface, oven and broiler—we now have automatically and accurately controlled temperatures for almost 100% of

all the foods cooked in the home.

In the steam oven we have maintained a temperature of around 214° F., a few degrees above boiling and at less than 1 lb. pressure. The food is cooked by the boiling temperature and not by the pressure.

With this new home equipment controlling steam temperatures, a great stride has been made in the approach to the ultimate in food cooking. To the modern homemaker ever on the alert for improving the health of her family, in the equipment of her kitchen, the 4th zone will appear as important an innovation as the mechanical refrigerator 20 years ago.

A 4th Zone Steam Oven is equipment for which the women of America have asked; a means by which they can prepare nutritious meals for their families.

REBECCA SULLIVAN

Gas Service Co., Topeka

Clock-Controlled Gas Ranges

AS Home Service people you will undoubtedly be interested in the use which the housewife makes of the clock after she has purchased it. In many instances the housewife does not use the clock except as a timepiece and as a minute minder. Yet, this becomes a convenience which she is reluctant to give up once she has used it. Many more, particularly in the case of women who work, use it almost daily. Regardless of whether she uses it or not, it definitely had sales appeal; otherwise she would not have bought it. And since clocks were put only on the better models of ranges, it meant that she had purchased the best range the gas industry had to offer.

Being Home Service people we are interested in the results of the promotion of oven meals, using the clock. In all our experience, plus many tests run by our laboratories, it is indicated within practical limits that food spoilage is negligible. What little spoilage has occurred has been due to the fact that the food was on the verge of spoilage before being placed in the oven or that a poor choice of food combinations had been made, such as those that separate upon standing whether in an oven or not. Home Service can do much to promote the use of the oven and clock by working out good food combinations, giving advice on proper pans and accurate times and temperatures.

A nationwide appeal is being made by our competitors on the basis of automatic cookery and we can ill afford to overlook or depreciate anything which puts our product in a superior class and lets the world know that a modern gas range has everything the competition has to offer plus speed and economy.

GLADYS B. PRICE

So. Calif Gas Co.

Programs Of Home Service

LIKE all Home Service departments, we have been carrying on the usual pattern of programs designed to provide service to our customers and maintain good will for our company. A year ago our department was transferred from the Sales Department to the Personnel and Customer Relations Department, with a consequent shift in the emphasis of our programs. Our department makes some 20,000 personal contacts with customers each year through the medium of lectures, demonstrations, telephone and floor requests and other services. In addition to these usual programs we conduct some that have more specific applications as described below.

The first was a summer program for children of employees carried on for five weeks during July and August. It was designed to acquaint the children with the operations and services performed by the company.

Our company departments are scattered in five locations throughout the city, and the children visited each one trying their hands at the jobs their fathers carry on every day.

The second employee program was developed for wives of employees. Meetings are held one afternoon and evening a month with an average attendance of 100. Program subjects receiving the most votes were Meal Planning for My Family, Kitchen Modernization, Planning Parties, Getting the Most for Our Dollars, Frozen Foods, Half-Hour Meals, New Home Equipment, Lunch Box Meals and Picnic Packs.

For the last ten years the Home Service department has been presenting cooking and nutrition classes for Girl Scouts, with approximately 2000 girls attending during that period. In addition, the department makes up the menus and recipes used in the Girl Scout day camps conducted in the city parks each summer. The Home Service department presented a series of classes on "America's Cookery" for foreign brides last fall.

At present, we are conducting monthly cooking classes for the Y-Teens, the high school members of the YWCA.

The Home Service department runs a weekly column, written by the director, in four newspapers. It is paid advertising in three of the papers and is run free in the fourth.

BLANCHE KERR

Central Ill. Electric & Gas Co.

Good Service On Gas Refrigerators

THE following suggestions are recommended for good refrigerator performance and, if followed, will go far to give good customer satisfaction:

1. Keep the refrigerator clean.
2. Keep the inside of the cabinet clean.
3. Keep racks and shelves clean.
4. Keep ice-cube trays and grids clean.
5. Never use abrasive material to clean porcelain or aluminum parts.
6. Do not sweep dust and dirt under the refrigerator.
7. Do not store brooms, mops, rags, etc. around and behind the refrigerator.
8. Take good care of the rubber door gasket.
9. Don't allow grease or cooking oils to accumulate on the door gasket.
10. Keep door gasket waxed.
11. Do not allow grease or cooking smoke to accumulate on the cabinet finish.
12. Clean outside of cabinet with mild white soap and water. Use Newtone cleaner and polish.
13. Don't slam the refrigerator door.
14. Handle the removable parts carefully.
15. Do not allow thick coatings of frost and ice to accumulate on the evaporator.
16. Do not open door more than necessary.
17. Cover liquid and moist foods.
18. Use pre-cooled water, stored in the refrigerator, for ice-cubes.
19. Keep water in covered container.
20. Do not over-fill cube trays. Fill to about one-eighth inch below top of grid.
21. Wipe trays dry on bottom and sides before placing in freezing compartment.
22. Defrost in early evening if possible.
23. Completely remove all frost when defrosting.
24. Defrost the day before buying weekend food supply.
25. Allow air circulation within the cabinet. Arrange food so that air can circulate around it.
26. Do not use ice picks to remove ice cubes.
27. Hold tray and grid under stream of water until cubes break loose.
28. Do not cover shelves and racks with shelf paper. This blocks air circulation.

W. W. MARSHALL

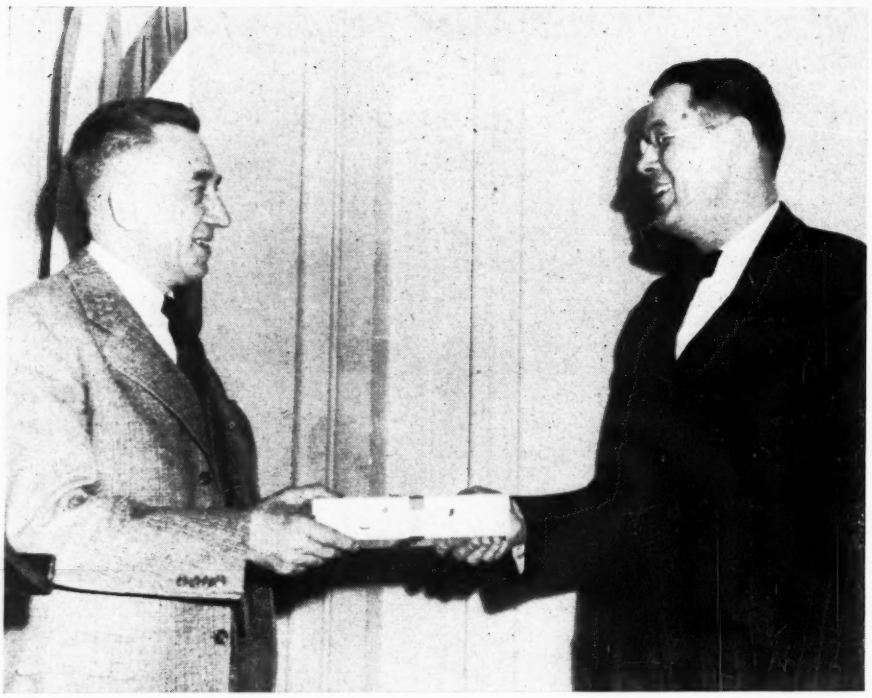
Minneapolis Gas Light Co.

Proven ***post-war leadership . . . strength and dependability without an ounce of needless weight, the meter with a future!***

THE SPRAGUE METER CO.
BRIDGEPORT, CONN.

AT BOSTON

A.G.A. Industrial and Commercial Gas Sales Meeting, March 17 - 18



KARL EMMERLING, chairman of the Industrial and Commercial Gas Section of the A.G.A., presents traditional gavel to immediate past chairman, Harry A. Sutton, Public Service Electric and Gas Co., Newark, N. J.

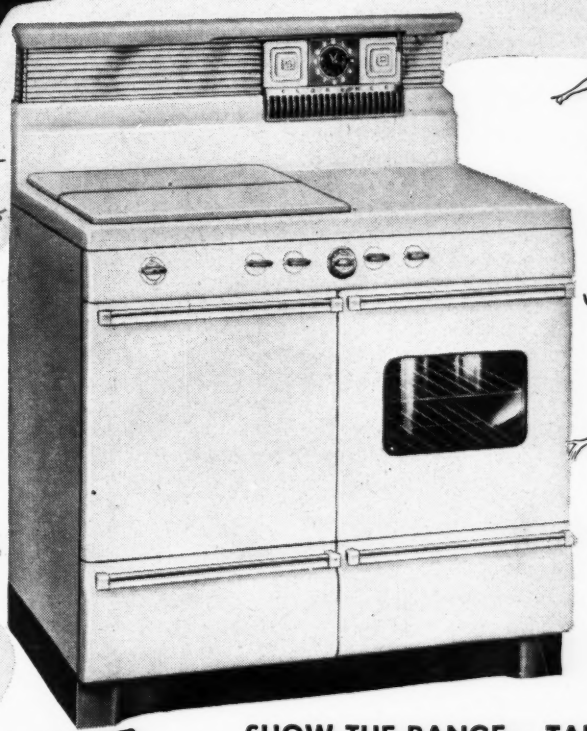
ONE OF the featured speakers was K. Camille Den Dooven, research director, H. A. Johnson Co., Boston.

HALE A. CLARK, Michigan Consolidated Gas Co., Detroit, addresses assembled salesmen. Seated are Emmerling, East Ohio Gas Co. (at left); Mahlon A. Combs, A.G.A.; Charles C. Eeles, Ohio Fuel Gas Co., Toledo, who presided at luncheon.

OVER THE HEADS of some of the salesmen who attended the conference are shown guests and officials at the speakers' table. From left: William Webster, New England Power Association, Boston; Frederic O. Hess, Selas Corp. of America, Philadelphia; E. H. Eacker, Boston Consolidated Gas Co.; Dr. George Harrison, Massachusetts Institute of Technology, Cambridge, Mass.; Emmerling; R. H. Hargrove, president, American Gas Association; Frank H. Adams, Surface Combustion Corp., Toledo; L. E. Knowlton, president, New England Gas Association, Frederick T. Potter, Whitin Machine Works, Whitinsville, Mass. One hundred eighty-five men attended the conference.

FLORENCE SAYS!

CASH IN ON THE "SELL-ON-SIGHT" FEATURES OF THE NEW FLORENCE *REGISTERED* GAS RANGES



"HI-LO BURNER CONTROL SAVES FUEL... SAVES MONEY"

"EASY TO CLEAN"

"BROILS, ROASTS, BARBECUES... FOODS COOK BETTER, TASTE BETTER IN WAIST-HIGH BROILERCUE*"

"2-OVEN CONVENIENCE SAVES TIME. LARGE SIZE OVEN PLUS BROILERCUE LETS ME BAKE, ROAST (OR BROIL) COMPLETE DINNER AT ONCE"

No Other Gas Range has all these 7 Sell-on-Sight Features

1. Completely New STREAMLINED "TURRET TOP" Design
2. TWO-OVEN CONVENIENCE
3. Exclusive New FOCUSED-HEAT BROILERCUE*
4. Famous, Over-Size FLORENCE BAKING OVEN
5. New Deluxe TOP LIGHT, Combination TELECHRON ELECTRIC CLOCK and TIME REMINDER — Handy UTILITY OUTLET
6. New C-Quik Gas Cock HANDLES
7. Convenient, EASY SERVICING FROM THE TOP

*Patents Applied for

SHOW THE RANGE...TALK ABOUT ITS FEATURES...

And the Women Will Sell Themselves!

•That's all you have to do! Just let a woman see the completely new Florence design inside and out . . . Open that easy-to-use, waist-high Broilercue — talk about its exclusive "Focused Heat" feature that will give her more delicious, more healthful food with less shrinkage. Tell her how the 2-oven operation lets her bake cakes, casseroles in the oven while she roasts or broils in the Broilercue. Remind her that *this* range is the result of the greatest housewife survey in the industry — built, with 70 years of Florence skill and experience, to suit *her* needs. It's the range that has *everything* a woman wants in her kitchen . . . That's why they'll say "Give me '*Florence*'" every time!

Florence
GAS RANGES

FLORENCE STOVE COMPANY . . . General Sales Offices and Plant: Gardner, Mass. Western Sales Offices and Plant: Kankakee, Ill. Southern Plant: Lewisburg, Tenn. Other Sales Offices: One Park Avenue, N. Y.; 1459 Merchandise Mart, Chicago; 53 Alabama Street, S. W., Atlanta; 301 No. Market Street, Dallas.

ASSOCIATIONS

Natural Gas Department Tackling Major Problems At Conference

FOUR of the most pressing problems facing the natural gas industry in 1947 are being aired by the nation's leaders during the A.G.A. Natural Gas Department's spring meeting, which convened April 30 for a two-day run at the Stevens Hotel, Chicago.

These problems—and the men chosen to attack them—are:

"Well-Head Price Fixing," by Glenn Clark, vice president and general counsel, Cities Service Gas Co., Oklahoma City, Okla. Appropriately, it was Cities Service that was involved in a recent court fight with Peerless Oil & Gas Co. which ended in a victory for the latter company, when the Oklahoma Corporation Commission set a price of 7 cents per Mcf for gas delivered by Peerless in the Guymon-Hugoton field. The order has since been appealed. It has been anticipated that this price-fix will set a precedent for other governing bodies.

"Problems of the House Heating Load," a summarization of experiences and policies in various sections of the country, by Irving K. Peck, vice president and general manager, The Manufacturers Light and Heat Co., Pittsburgh, Pa.

"What Is Being Done to Eliminate Flare Gas Wastage," by Ernest O. Thompson, chairman, Texas Railroad Commission, Austin, Texas. A burning question in that state, the problem of flaring was recently accentuated by a fight between the commission and producers precipitated by the commission's order that Seeligson field, Jim Wells county, should be shut down April 1 unless steps were taken before that date to turn wasted gas to a useful purpose.

"Conservation as Viewed by The Interstate Oil Compact Commission," which offers other aspects of the overall proposition of gas saving, by Hiram W. Dow. commission chairman, Roswell, N. Mex.

The program was developed by a committee chairmanned by Floyd C. Brown, president, Natural Gas Pipeline Co. of America, Chicago, with A. F. Bridge, vice president, Southern Counties Gas Co., Los Angeles; Gardiner Symonds, president, Tennessee Gas and Transmission Co., Houston, and C. H. Zachry, president, Southern Union Gas Co., Dallas, as members.

Other events of importance are the interim report of the Subcommittee on Pipe Line Flow, presented by J. W. Ferguson, natural gas engineer, U. S. Bureau of Mines, Amarillo, Texas; Underground Storage Symposium, a discussion period presided over by L. T. Potter, chairman, A.G.A. Production and Storage Committee, and assistant to the president, Lone Star Gas Co., Dallas, Texas; "Research and Development Progress," by H. D. Hancock, chairman, A.G.A. Technical and Research Committee, and president of Gas Advisers, Inc., New York; a speech by President R. H. Hargrove and remarks by Second Vice President Robert W. Hendee, Natural Gas Department chairman, and convention chairman.

F. C. Brown

A. F. Bridge

Of no less, but more specialized, interest are meetings of the Transmission and Accounting committees. Their programs follow:

TRANSMISSION COMMITTEE MEETING
April 30, Afternoon

"Interesting Features of the 30-Inch California Line Now Under Construction," by F. A. Hough, executive engineer, Southern Counties Gas Co., Los Angeles, Calif.

"Operating Experiences with Angle Type Compressors," by O. H. Moore, assistant to vice president, Tennessee Gas and Transmission Co., Houston, Texas.

"Some Experiences in the Aerial Patrol of Pipe Lines," by G. F. Leamon, in charge of pipe line aerial patrol for Northern Natural Gas Co., and Panhandle Eastern Pipe Line Co., Omaha, Neb.

May 1, Afternoon

"Gas Turbines and Centrifugal Compressors, also Brief Review of Accomplishments and Developments in Jet Propulsion," by a representative of Allis-Chalmers Co.

"Availability of Propane and Propane Tank Cars, also The Need for Storage in Propane-Air Plants," by Herbert Bartholomew, Phillips Petroleum Co., New York.

ACCOUNTING COMMITTEE MEETING
April 30, Afternoon

The following subjects will be discussed:

Depletion accounting, tax problems peculiar to the natural gas industry; accounting for and tax treatment of geological, geophysical and exploratory drilling costs; various methods of treatment in the accounts of the companies of tax reductions resulting from deductions of intangible drilling costs; job training programs for natural gas company accounting personnel; job evaluation programs for natural gas companies; merits of centralized vs. decentralized billing of customers; uniform classification of accounts for natural gas companies; classification of accounts for propane plants.

Sales Council Speaker Foresees Steel Upturn

A BRIGHTER picture in steel for 1947 and 1948, but one which is still darkened by increased needs and abnormal demands, was painted by Bennett S. Chapple, Jr., assistant sales vice president of the United States Steel Corp., in the featured address before an enthusiastic audience at the A.G.A.'s Mid-West Sales Council, held under the auspices of the Residential Gas Section at the Edgewater Beach Hotel, Chicago, in March. Over 600 gas men turned out for the affair.

Chapple foresaw a capacity output of 19 million tons of steel sheet and strip late this year or early next year, as compared with 16 million prewar and 14 million in 1946. This prediction was conditioned by the strike question. Further conditions imposed upon availability for gas equipment and appliance manufacturers are the prior considerations of veterans' housing, perishable food canning for destitute countries, freight car production to alleviate the serious shortage, and demands of other industries, he said.

Sales prospects of the gas industry were presented in a talk which was one of the features of the second day's sessions. Stressing the now widely-accepted fact that the buyers market is near, W. C. Gordon, research and market analyst, Curtis Publishing Co., advised his listeners to pay less attention to labor and regulatory problems and spend more time thinking about the consumer. Develop sales, he said, through market research, advertising, and promotion.

Other talks of interest during the two-day meeting were by:

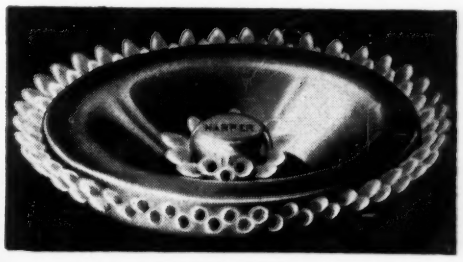
F. X. Mettenet, vice president, The Peoples Gas Light & Coke Co., Chicago, who spoke on relations of dealer, manufacturer, and utility, and stressed three sales fundamentals; raising, controlling, and annually improving the quality of a product.

This is the new, improved

HARPER CENTER SIMMER BURNER

HERE is the new Harper top burner that is winning widespread acclaim from the gas industry. It will find equal favor with housewives because it makes possible even better cooking results than users of the Harper Burner have enjoyed in the past.

Years of laboratory research and field tests contributed to the development of this scientifically engineered burner. The net result is that it makes possible fuel savings up to 39%, eliminates guess-work in cooking, saves pot-watching, keeps kitchens cooler, offers more healthful, less wasteful cooking . . . cleaner, odorless cooking.



▲ NEW, IMPROVED CONSTRUCTION!

Note how the two rows of flame ports are staggered, permitting better flame adjustment than is possible with ordinary top burners . . . flames do not "float off" or blow away . . . combustion is more efficient.

◀ EASIER TO CLEAN!

No castings or bolts to remove . . . a slight twist removes burner for cleaning.

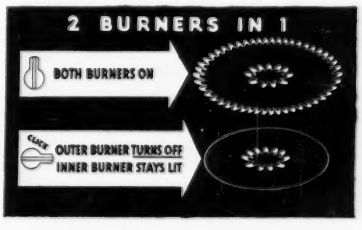
We're telling your Customers about it!

Before Buying Your
NEW RANGE
. . . make sure it has the famous
HARPER CENTER SIMMER BURNERS
look inside for the booklet with this seal
TOP BURNER COOKING
The Harper Center Simmer Burners are superior to ordinary top burners because each Harper burner is really 2 burners in 1. As shown in diagram, the big outer burner brings foods to a quick boil. Turn handle until it "clicks" and the big burner goes out, leaving only the small, efficient inner burner lit to finish the cooking.
Only the separate Harper Center Simmer gives you the controlled low heats you need to keep foods warm for serving . . . to eliminate pot watching and boiling dry . . . to allow cooking with little water, which saves time and gas and keeps the average kitchen 9 degrees cooler. Only the Harper separate Center Simmer can help you so much in your cooking.
Insist on Harper Burners!
#18 Leading Gas Ranges are Harper Equipped
2 BURNERS IN 1
BOTH BURNERS ON
CLICK
OUTER BURNER TURNS OFF
INNER BURNER STAYS LIT
HARPER-WYMAN COMPANY, CHICAGO 20

A NEW CONSUMER advertising program appearing in leading women's magazines tells prospective range buyers about the advantages of the Harper Center Simmer Burner. Many of these 21,500,000 readers will buy from *you*, and here's how you can trade them up to a higher-priced range:

We have prepared a FREE booklet, "How to Sell More Gas Ranges," which contains a series of quick, convincing sales floor demonstrations that graphically illustrate the superiority of the Harper Center Simmer Burner. Send for copies for your salesmen. Harper-Wyman Company, 8565 Vincennes Avenue, Chicago 20, Ill.

The Harper Center Simmer Burner operates on the unique principle of "2 burners in 1" . . . a STARTING BURNER for frying and to start foods boiling, plus a small, economical COOKING BURNER, to maintain the cooking . . . both controlled by the same handle. It is subject to finer gradations of low heats—greater control and economy—than any other top burner made.



HARPER CENTER SIMMER BURNER *". . . Holds the Lines for Gas"*

HARPER CENTER SIMMER

Harold E. Jalass, Cribben & Sexton general sales manager, who helped allay fears of the competition with a demonstration showing the superiority of gas cooking.

Dr. Kenneth McFarland, superintendent of schools, Topeka, Kan., who drove home the necessity of understanding human beings and putting this understanding to use.

H. Carl Wolf, A.G.A., managing director, who outlined A.G.A. activities devoted to helping increase sales.

W. M. Chamberlain, Residential Section chairman, who reported on the activities of the section in aiding selling.

B. T. Franck, vice president, Milwaukee Gas Light Co., who showed how utilities could help the city and at the same time cut distribution costs through a postive program of decentralization which would discourage too-rapid expansion of fringe and rural building developments.

E. Carl Sorby, Geo. D. Roper Corp., who gave his dramatic presentation on the advantages of automatic cooking.

H. Vinton Potter, New Kitchen expert, who outlined a forthcoming certification program.

R. J. Caniff, Servel, whose troupe presented a skit on kitchen planning.

Helen Kirtland, The Ohio Fuel Gas Co., who told of new developments in home service.

Mary Mark, Chicago Public Schools, and Lloyd C. Ginn, American Stove Co., who pointed out gas promotion work being done in schools.

Rebecca Sullivan, Gas Service Co., Topeka, Kan., who demonstrated the Fourth Zone steam oven.

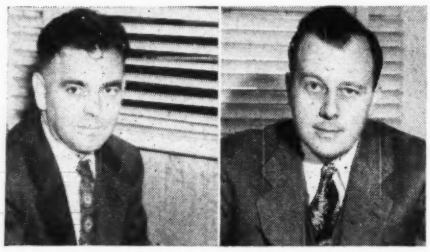
H. D. Valentine, Peoples Gas Light & Coke Co., arranged the program. Chairmen included J. C. Sackman, council chairman, and B. H. Wittman, chairman elect.

Amendments Approved

A.G.A. Secretary Kurwin R. Boyes has announced that by an almost unanimous mail vote, the three proposed amendments to the association's constitution and by-laws were approved last month. The amendments provide:

1. Enlarging the board by nine members, including the chairman of the A.G.A. Laboratories Managing Committee. The membership of the board would thus number 30. A. F. Bridge, Southern Counties Gas Co., is at present chairman of the managing committee.
2. Setting up an executive committee to act for the executive board between meetings. This idea is intended to speed operations of the association.
3. Making possible a more practical method of approving and paying bills.

Personnel Change At Lab



A. A. Jacquot C. E. Koch

Charles E. Koch has been appointed assistant supervisor of the Pacific Coast Branch of the American Gas Association Testing Laboratories, while Alfred A. Jacquot, chief inspector at the Los Angeles branch, has resigned to become affiliated with the Detroit Brass & Malleable Works as a sales engineer, Director R. M. Conner has announced.

Koch returns to the laboratories staff after five years of experience in the gas appliance field, having been associated with the General Water Heater Corp., Burbank, Calif., as assistant chief engineer since 1941. He was in charge of process and quality control in the plating department, tooling operation planning, machine design for plant production, research on domestic water supply, and corrosion of water heater tanks. A graduate of Oregon State College with a degree in chemical engineering, he first joined the laboratories in 1939.

PGA

39th Annual Meeting

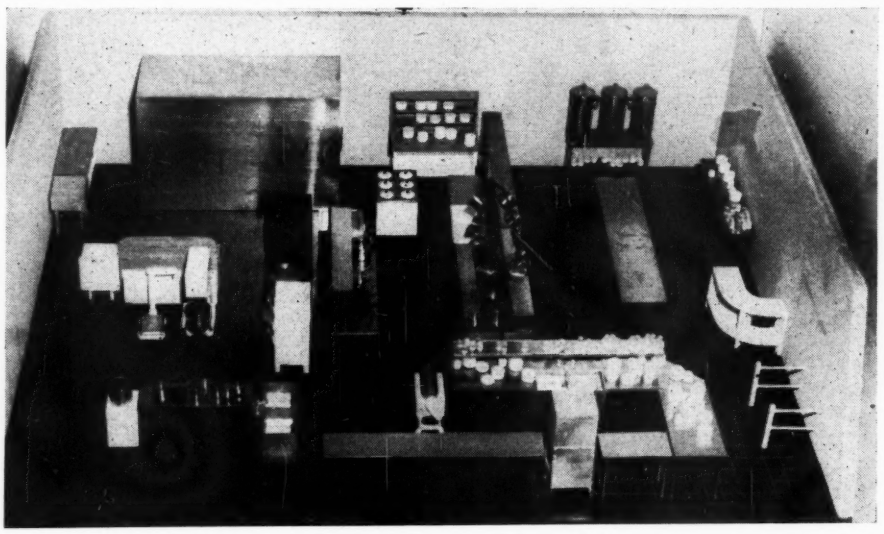
Tentative program for the 39th annual meeting of the Pennsylvania Gas Association, to be held at Galen Hall, Wernersville, May 20-22 was announced last month by William Naile, secretary. High points will include addresses by Louis Ruthenburg, president, Servel, and F. H. Trembly, association president, and five special sessions on the following subjects: production, distribution, accounting, customer and employee relations, and sales promotion.

The production conference will present A.G.A. Gas Production Committee coordinator E. L. Hall speaking on research, and E. H. Smoker, United Gas Improvement Co., on LP-gases as used in the gas industry.

Distribution meeting will feature a job training discussion and a talk on "The Economics of Distribution in Outlying Districts," by H. W. Battin, Philadelphia Electric Co.

"Effect of The 5-Day Week on Accounting and Customer Service Departments," by Daniel Ballison, Philadelphia Gas Works Co., will be the chief topic of discussion in the accounting meeting.

A safety talk by Howard T. Jayne. Philadelphia Gas Works Co., and "Explaining the Company to the Employees," by Edward M. Clark, are scheduled for the employee and customer relations program.

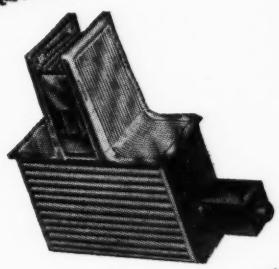


A scale model commercial kitchen set up in the A.G.A. booth was one of the star attractions at the National Restaurant Exposition, held at the Hotel Stevens, Chicago, March 25-28. Resting in a glass case in the center of the booth, the kitchen was complete in each intricate detail.

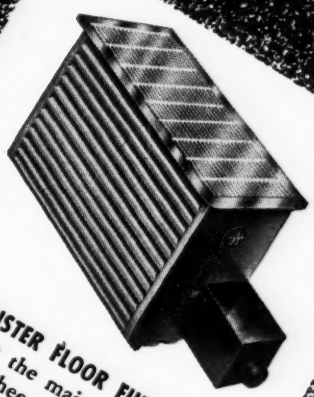
Fifteen thousand viewed the various exhibits of gas appliance manufacturers. Bake ovens, broilers, deep fat fryers, steam pressure tables, and many other gas-using devices were displayed by the 32 manufacturers.

Dishwashing equipment drew a large share of interest from spectators. With sanitation measures and superheated water uppermost in the minds of many, inquiries into gas water heating equipment were numerous.

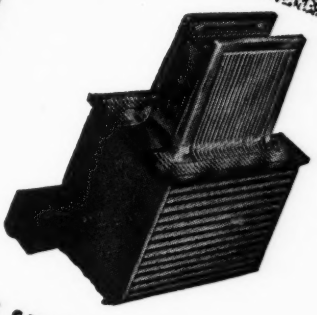
Now, You Can Sell ALL THREE Floor Furnace Markets



STANDARD DUAL WALL FURNACE . . . Heats rooms on both sides of the wall, and is so well designed, that no re-papering or replastering is EVER necessary to install it. Fits easily into new or old homes. This Rheem wall furnace solves the heating problem for a whole lot of your customers . . . and this brings new profits to you.



FLAT REGISTER FLOOR FURNACE . . . Built to fit the majority of heating needs, the Rheem flat register has a handsome streamlined grille . . . com-plete safety built-in . . . and new, easy installation features that will make it one of your fastest selling units.



SPACE SAVER WALL FURNACE . . . Newly designed grille uses only 9½ inches of floor space . . . and heats rooms on both sides of the wall. Its compact design makes it ideal for homes where floor space is limited.

Here are two other great Rheem gas heating appliances. The handy gas wall heater brings quick, radiant heat to bathrooms and other small rooms. The Rheem gas console heater is the easy answer to heating spare rooms, workshops or cellar playrooms. Both A.G.A. approved.

With Rheem, you'll have an A.G.A. approved floor furnace to fit any heating job . . . any customer's needs. This means more quick sales . . . more satisfied customers . . . and more profits for you.

So get this Rheem line of gas heating appliances into your store right away, and then watch your volume go up and up. Call your plumbing and heating jobber . . . TODAY. For full information, write Rheem, 570 Lexington Ave., New York 22, N. Y.

RHEEM

RHEEM . . . making houses into homes

CALENDAR

May

Industrial Gas School—Hotel Seneca, Columbus, Ohio, May 5-9.

Southwestern Gas Measurement Short Course—University of Oklahoma, Norman, Okla., May 6-8.

Commercial Gas School—Washington D. C., May 12-16.

Indiana Gas Association—French Lick Springs Hotel, French Lick, Ind., May 15-16.

Pennsylvania Gas Association—Wernersville, Pa., May 20-22.

Canadian Natural Gas and Petroleum Association—Royal Connaught, Hamilton, Ontario, May 22-23.

Liquefied Petroleum Gas Association—Hotel Sherman, Chicago, May 27-29.

Gas Appliance Short Course—University of Tulsa, Tulsa, Okla., May 27-30.

June

American Gas Association Joint Production and Chemical Committee Conference—Hotel New Yorker, New York City, June 2-4.

Canadian Gas Association—General Brock Hotel, Niagara Falls, Ontario, Canada, June 9-11.

American Society of Mechanical Engineers, Semi-Annual Meeting—Chicago, June 16-19.

American Gas Association Residential Gas Section, New York-New Jersey Gas Sales Conference—Essex and Sussex Hotel, Spring Lake, N.J., June 23-24.

July

Michigan Gas Association—Grand Hotel, Mackinac Island, Mich., July 7-8.

September

American Society of Mechanical Engineers, Fall Meeting—Salt Lake City, Utah, Sept. 1-4.

Pacific Coast Gas Association 1947 Convention—Coronado, Calif., Sept. 23-25.

October

American Gas Association Annual Convention—Cleveland, Ohio—Oct. 6-8.

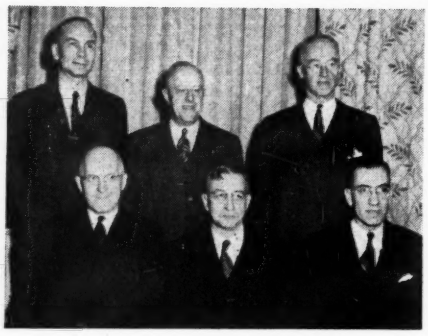
National Metal Congress and Exposition—Amphitheater, Chicago, Oct. 20-24.

November

National Hotel Exposition—Grand Central Palace, New York, N. Y., Nov. 10-14.

December

American Society of Mechanical Engineers Annual Meeting—Dec. 1-5.



New NEGA officers: (Front row) J. A. Cook, pres.; L. E. Knowlton, past pres.; E. G. Twohey, 1st vice pres.; standing, C. Belden, secy.; O. Price, treas.; A. Lindsley, 2d v. p.

NEGA

Convention Airs Inch Gas Prospect

GEARED by advance announcement and in prepared papers to the theme of "Public Relations and the Public Interest," the 20th annual Business Conference of the New England Gas Association, found itself preoccupied with two subjects of major attention, in its March 20-21 meeting at the Hotel Statler in Boston. For the pressing problem of an immediate increase in the winter peak gas supply, and the speculative possibility of natural gas via the Big Inch or other long distance transmission lines as the solution of that urgency, shared top billing in interest through the two days.

Even the prepared papers dealing with various aspects of gas sales digressed, of necessity, into discussions of how to keep sales down until the gas supply can be built up, and how to keep customers and potential customers happy and hopeful in the process.

Better informed than the average on matters of company relations, the members of the New England Gas Association have already attracted industry-wide acclaim by their attention to and consideration of the public interest in connection with gas utility management and operating policies. Stressing the necessity for still further effort in this respect, Executive Secretary Clark Belden said in his annual report: " . . . there is considerable evidence that business management is going to rise or fall in the next few years on the one question of where it stands and what it does with respect to the public interest."

Louis Ruthenburg, president of Servel, Inc.; Glenn Griswold, publisher of "Public Relations News"; E. Wight Bakke, professor of economics, Yale University, and L. E. Knowlton, president of the NEGA, all discoursed in detail on some aspect of the public relations theme. Recognized and emphasized by all was the fact that a concept of public relations as a publicity handout service has been long outmoded; only a sincere and continuing effort to mold policies to the public welfare can now be productive of the public respect and confidence upon which the very existence of private ownership in the utility field rests.

Paul R. Taylor, vice president of Stone and Webster Service Corp., realistically reminded the manufactured gas men that while natural gas in theory can be considered right at New England's door, in actual fact it may be many months or even years away. Facing an audience where some wishful thinking had begun to take the place of gas transmission calculations, he examined in matter-of-fact terms the many problems which face pipe line companies and distributors.

Switch To Cleveland

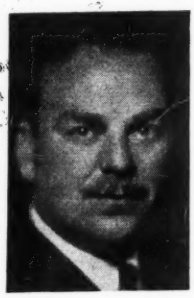
It's Cleveland—not San Francisco—in 1947.

So says the executive board of the American Gas Association, and what they're talking about is the annual convention. Originally scheduled for San Francisco Sept. 29-Oct. 3, it has been moved by official decree to the Ohio city, and the date has been changed to Oct. 6-8.

The revision was necessitated by the lack of hotel accommodations in California's convention mecca. Decision was announced following a meeting in Boston March 21.

The board announced it still hopes to hold a convention in San Francisco at a later date. This is the second time that a Bay City meeting has had to be transplanted. In 1942, the war interfered.

GAMA Elects



J. Robertshaw

F. Hoenigman

John A. Robertshaw, president, Robertshaw Thermostat Co., was elected to succeed D. P. O'Keefe as president of the Gas Appliance Manufacturers Association during the first day of GAMA'S annual meeting in Chicago April 14.

Other new officers included Frank J. Hoenigman, Florence Stove Co., vice president; Frank J. Nugent, Rheem Manufacturing Co., second vice president; John Van Norden, American Meter Co., treasurer, succeeding himself.

Robertshaw was last year's first vice president, and Hoenigman was second.

OKLA. UTIL. ASSN.

Public Relations Keynotes Meet

By O. D. HALL

GAS and electric utilities were left free to discuss their mutual problems and interests in a two-day state convention of the Oklahoma Utilities Association, at the Hotel Tulsa, Tulsa, Okla., March 20 and 21.

John Rogers, Tulsa attorney, who discussed, "Constructive Public Policy," emphasized the necessity of learning about the economic system and government fundamentals which distinguish America from all others and which have been responsible for developing free management and free labor, where employers strive to sell their goods and services at a profit and at the lowest possible prices consistent with sound business, and where wage and living standards are the highest in the world. At the convention dinner, Jeff H. Williams of Chickasha struck the same keynote, adding humor to the more sober remarks by Rogers.

Will C. Grant, former advertising manager, Lone Star Gas Co., Dallas, in his talk, "It's Time to Speak," urged all executives to prove to the public that they are not ashamed to proclaim the virtues of the profit system and of American free enterprise.

Davis M. DeBard, vice president, Stone and Webster Service Corp., New York, urged gas and electric utilities to dress up their lobbies, with attractive displays of appliances arranged, as far as possible in homelike surroundings and with appliances connected to fuel or power supply and ready for immediate demonstration. He pointed out that a large percentage of housewives come to the utility office each month to pay their bills, and that here is a rare opportunity to show "live" appliances, set in spaces with three walls and ceiling, simulating kitchens, dining rooms and living rooms in homes.

The great importance of efficient training of supervisors and foremen was brought home in a talk by L. A. Crittenton, National Association of Foremen, Chicago. He said that there is vast reserve power in the employees of a company and it is the business of the supervisor to bring that out in his own department. "There are 5 million man-hours in this country that have not been a factor in production," he declared.

Joseph W. Bowes, Tulsa, president of the Oklahoma Natural Gas Co. and of the Independent Natural Gas Association of America, appeared before the convention to urge support for bills introduced in the House of Representatives by Oklahoma Rep. Ross Rizley, and in the Senate by Oklahoma's Sen. Ed Moore, to limit the jurisdiction of the Federal Power Commission to the functions intended in the original Natural Gas Act.

W. H. Stueve, chief power consultant, Oklahoma Gas & Electric Co., Oklahoma City, presented illuminated slides which showed that 80% of manufacturing in the United States is located in the southeastern and northeastern regions and in California. Analysis of 484 reasons which influenced 73 industries to choose their locations showed that nearly half of them had to do with railroads and distribution.

The Gas Division of the association elected D. W. Reeves, Oklahoma Natural Gas Co., Tulsa, as its chairman, succeeding L. A. Farmer. The Electric Division named C. N. Robinson, Public Service Co. of Oklahoma, Tulsa, as its chairman to succeed Malcolm Morrison, of Oklahoma City.

Kate A. Niblack, secretary of the association, reported convention registration at about 300 and banquet attendance at 350.

MID-WEST GAS OFFICIALS

A. C. Rathkey

L. C. Eck

WITH 360 gas men attending, the Mid-West Gas Association opened its 42nd annual meeting and convention at the Hotel Paxton, Omaha, Neb., April 7-9, by electing E. J. Otterbein, Iowa-Illinois Gas and Electric Co., Davenport, Iowa, its new president.

Otterbein succeeded E. C. Deane, Central Electric & Gas Co., Sioux Falls, S. Dak.

Other officers named were: A. C. Rathkey, Iowa Public Service Co., Waterloo, Iowa, first vice president; Lester J. Eck, Minneapolis (Minn.) Gas Light Co., second vice president, and R. B. Searing, Sioux City, Iowa, secretary-treasurer.

Directors include: Frank Carpenter, Minneapolis, Minn.; Paul C. Kreuch, Chicago; Roy H. Whitesell, Minneapolis, Minn.; Burgess Manchester, Omaha, and V. A. Houston, Scottsbluff, Neb.

At the Oklahoma meeting: S. I. McElhoes, Chicasha, pres.; Kate Niblack, Oklahoma City, secretary; L. A. Farmer, Ponca City, 1st vice pres.; W. R. Thomas, Ada, director.

R. H. Dott, Okla. Geol. Survey; Steve Stahl, Okla. City; D. W. Reeves, Okla. Natural Gas Co., new gas division chairman; W. H. Stueve, Okla. Gas and Electric Co.

API

Division of Refining Mid-Year Meeting

Refineries — their construction, repair, design and inspection—and gasoline are the two topics on which chief interest will center when the American Petroleum Institute Division of Refining holds its mid-year meeting at the Jefferson Hotel, St. Louis, Mo., June 2-3.

The refinery problems will come up for discussion at the afternoon session on the first day, with Walter Samans, Sun Oil Co., directing. Gasoline as it relates to other refinery products will occupy attention at both sessions the following day, with W. M. Holaday, Socony-Vacuum, in charge.

TECHNICAL TRENDS

By GUY CORFIELD

Odor Standards

ODOR has always been one property that has defied instrumental detection and numerical evaluation; and so far it has been necessary to depend on the vagaries of the human nose and to describe the nature of an odor by adjectives such as "sweet" or "sharp," or by similarity to some well known substance, and the intensity of an odor by the non-quantitative terms "faint," "strong" etc.

The gas industry, in common with many others, has occasion to attempt the evaluation of odors emanating from plants, processes, and products. One specific requirement is the judging of intensity of odor of odorized natural gas, and many an hour has been spent in "closed room tests" and in arguing whether the odor is too strong or not strong enough, or different from what it was at some previous time.

According to current announcements, Cargille Scientific Inc., 118 Liberty St., New York 6, is putting on the market a kit which, while it does not provide instrumental detection and still depends on the human nose, does furnish reproducible and permanent standards by which any odor can be evaluated and assigned a definite 4-digit number.

The kit consists of 32 small numbered vials of odor-producing material, composed of four basic odor "components," each in eight different intensities. The four components are described as fragrant, acid, burnt and caprylic (pertaining to fatty acids), and it is claimed that any odor can be reproduced by suitable combination of the four components at selected intensities and thus given its four-digit identification. It is said that checks can be made by different persons at different locations, without appreciable personal variation and with relatively little practice or time spent in selection. The range of odors mentioned includes fishy, rancid, tarry and oriental, and among suggested users are the food, soap, rubber, paint and petroleum industries.

Gas Pyrometers

OF the many problems encountered in exact temperature measurement, one of the most difficult is that presented by high temperature gas streams in pipes or other enclosures where the temperature-sensitive element is subject to errors from radiation to or from the walls of the enclosure. An example would be measurement of the temperature of hot flue gases in a pipe surrounded by normal temperature air; considerable error would be encountered if an ordinary unshielded thermometer bulb or thermocouple junction were inserted in the gas stream, because of radiation to the pipe wall.

Some years ago the American Gas Association Testing Laboratories developed for such measurements the "high velocity thermocouple," essentially an assembly whereby the thermocouple junction is shielded in a refractory tube with provision for drawing a stream of the flue gas into and through the tube.

A recent development at the National Bureau of Standards, growing out of research on gas turbines and jet engines, assertedly accomplishes accurate temperature measurement of high-temperature, high-velocity gas streams by means of a thermocouple junction around which is formed a small thin silver shield. The silver, described as a good reflector and a poor radiator of heat, keeps the junction very close to the actual gas temperature and is sensitive to temperature changes. Also it is relatively simple and easy to construct and install, and of convenient size and shape.

Bottom of The Barrel

MUCH has been recently written and spoken on the rapid decline of our natural resources, but the tendency is to discount such statements or warnings with the thought that this is still an enormous and partially unexplored and undeveloped country and that new discoveries will be made, or that "substitutes" will be found that will be better than the original materials.

It is hoped that this less serious view can safely be taken, but it is difficult to feel too complacent when confronted with such statements as recently released by the Office of Strategic Services, that the known domestic deposits of important minerals, in terms of years of future supply, are as follows: antimony, 4—asbestos, 3—bauxite, 9—cadmium, 16—chromite, 1—copper, 34—gold, 14— lead, 12—silver, 11—tin, 1—tungsten, 4—vanadium, 7—zinc, 19. While it is probable that these figures are not exact, it is quite possible that they are of the right order of magnitude.

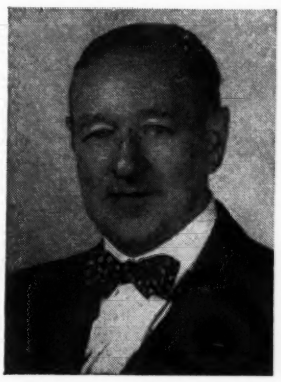
We are now in a period of shortages and substitution, and find it very disconcerting. Although attributed to lack of production it nevertheless gives us a taste of what could happen if there was lack of material. The lesson would seem to be conservation and efficient use, and research, resourcefulness and adaption in application of new and substitute materials, particularly those derived from raw supplies that can be grown and are therefore replaceable —and we should perhaps make up our minds that this is the future pattern rather than a temporary phase.

PROMOTIONAL NOTES AND NOTIONS

By STANLEY JENKS

Chicago

HAVING learned most of what little I know about the gas business in the Chicago metropolitan area, which we Hoosiers called our Illinois suburb in those days, I can get very sentimental about the place. It's a good gas town and a very fitting spot, in itself, for the Natural Gas Spring Meeting, besides being only overnight from Churchill Downs.



The first of the A.G.A. Regional Sales Conferences was started there. I wonder how many old-timers recall perhaps the most sensational session of them all in the ballroom of the Sherman Hotel, when the news of the St. Valentine's Day "Massacre" was flashed through. And the speaker, some years back, who read a paper describing a 100% house-heating gasification job he had done in a certain Midwestern town. It was terrific! Sensational! The applause was deafening. Then some spoil sport in the audience asked the speaker at what average rate the gas had been sold. Four cents a therm. There and then another sales genius died aborning.

But, seriously, the Regional Sales Councils in Chicago have served the gas industry well, and have been an important source for nationwide promotional ideas and techniques.

While this year the A.G.A. Natural Gas Spring Meeting program majors engineering and technical subjects, indirectly it is sales-minded, because everything to be discussed has one objective—the development of more facilities to serve more and more people.

Looking Ahead

NO industry is more interested than ours in the progressive growth of our population. In fact, a fundamental factor in utility management is providing service facilities in anticipation of residential and industrial growth in the territory served.

According to the Sixteenth Census of population by the U. S. Bureau of Census, over 32 million of our population in 1940 were under 15 years old. By 1950, 11 million of these will be out of school, and 7 million of them will be looking for jobs or will be job holders. That's a new crop of potential gas users. Or will they choose some other fuel? The answer rests with us to a great extent. Will we have the service facilities? Will our immediate promotional efforts be so directed that they will accept gas service as the most desirable that is available? Are the types of gas appliances in their parents' homes today creating the right attitude toward gas service when the day comes for them to make the choice?

Stokers

I wonder what the 7952 purchasers of coal stokers in 1946 think of their purchases now, when they see what Mr. Scowl is doing to their fuel costs. According to the U. S. Department of Commerce, 7044 were Class One; that is, their capacity was under 61 lbs. of coal per hour.

I know what a friend of mine did. He yanked it out, and installed a gas-fired boiler. At least, he justifiably concluded, that's one less major worry.

Incidentally, the total 1941 sales of coal stokers (all classes) was 17,709.

Fuel Conversion Factors

ALL gas heating salesmen, especially in the manufactured gas industry, run into the comparative-cost-of-operation argument. Probably it is not so vicious as it was in my pavement-pounding days, because Mr. and Mr. John Q. Public in the meantime have learned a thing or two about gas heating.

However, since one of the solid fuel publications in its current issue has raised the old argument again, it might be proper to discuss its real merits.

It advocates the following conversion factor as authentic and therefore proper sales ammunition to be used:

Average Btu per ton anthracite 26,000,000
Average Btu per gal. No. 2 fuel oil..... 138,500

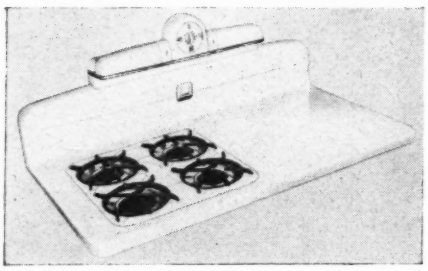
$$\frac{26{,}000{,}000}{138{,}500} = 187.7 \text{ gals.}$$

Isn't that just ducky? At 9 cents per gal., any price for anthracite coal at less than \$0.09 x 187.7 = \$17.89 is an anthracite bargain. Apply this same theory—and that's all it is—to gas, and where are we? Considering only manufactured gas, since anthracite is out of the picture anyway in natural gas territory, and assuming 550-Btu gas at 70 cents per Mcf, anthracite could stand a price of \$33 per ton, according to my slide rule, and still meet us on an equal cost basis. Nuts!

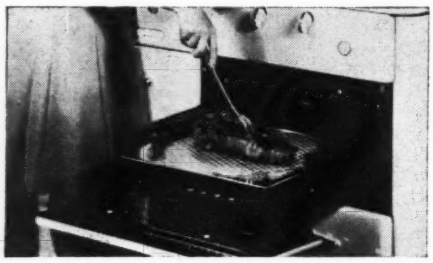
Of course, the whole thing is absurd, because the most important factor of all—thermal efficiency—is ignored. The average coal furnace is 25% thermally efficient at the most, whereas gas heating equipment, depending on whether it is converted or gas-designed, is from 70 to 85% thermally efficient. But in the interests of fairness, giving gas 60% and anthracite 25% thermal efficiency, one ton of anthracite is equivalent to 19.696 cu. ft. of 550-Btu manufactured gas, which even at 80 cents per Mcf costs \$15.75. That's the real story.

And despite the slight margin in favor of gas, we must also include the added cleanliness, convenience, and dependability that go with it.

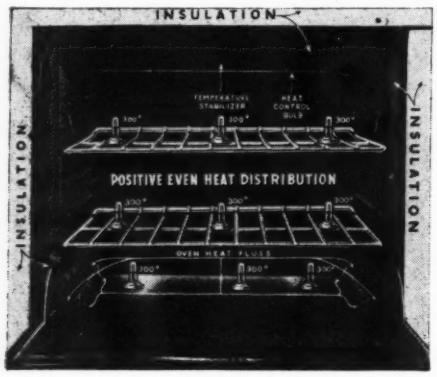
Top-to-Bottom Advantages



One-piece top integral with backguard. Minute-Minder and (extra) clock control.



Separate, waist-high broiler with smoke-proof grid. Gives speed, uniformity.



Oven with "stabilized temperature." Well insulated. Lights automatically.

Manufacturer: Cribben and Sexton Co., 700 N. Sacramento Blvd.,Chicago.

JUST introducted last month is Cribben and Sexton's newest Universal range, the Dalton (Model 4536; CP model 4586). Three innovations set this model apart from those previously in production:

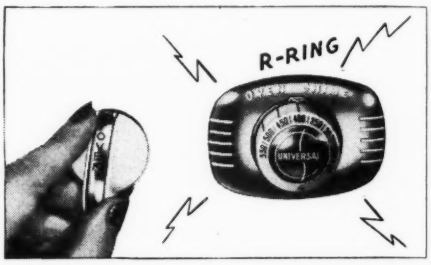
1. Separate, waist-high broiler, equipped with ceramic radiant tubes and savory smoke-proof broiler grid with chrome pan. This arrangement assures greater broiling speed and even distribution of oven heat.
2. Oversized 18- in. oven with oven-chime heat control. Two inches have been added to the oven width over other models.
3. Completely automatic clock control for oven operation (extra equipment).

In addition to the "big three" selling points, the Dalton offers many other advantages, some of which are also incorporated in other Universal ranges. The most important of these are listed below for quick reference:

NEW APPLIANCE
SALES POINTERS

Universal "Dalton" Range

1. *Minute Minder,* which can be set for any cooking period up to 60 minutes. Convenient for foods, such as boiled eggs, that have to be timed carefully.
2. *Elevated In-a-Drawer broiler* with spring-drop front section.
3. *Separate precision broiler burner* equipped with two ceramic radiant tubes.
4. *Savory smoke-proof, fire-proof, spatter-proof broiler grid* with chrome broiler pan. Through 418 precision counter sunk holes, melted fats and greases drain into a covered well. The grill completely covers the well, preventing entry of sufficient air to support combustion. The polished chrome surface of the well reflects heat, keeping the greases at a sub-smoking temperature. Lights automatically.
5. *One giant and three standard "Alltrol" simmer-save self lighting burners.* Three speeds — intense, for rapid heating to the boiling point; boiling, automatically set to give just the right amount of heat to keep the food cooking — claimed to save on an average of 35% of top burner cooking fuel; and "keep warm" heat.
6. *Eighteen-in. porcelain-lined precision bake oven.* Lights automatically. Temperature stabilizer, located in the oven top, properly restricts flow of heated air from the oven. This controls heat circulation and assures uniform distribution. With scientific heat flues, a maximum flow of heat enters along the oven wall linings and circulates around the inside oven.
7. *Porcelain thriftop* with round, easily removable porcelain cast thrift grates.
8. *"Oven-chime" automatic oven heat control.* For preheating oven: when proper temperature is reached, the chime rings and red indicator tab pops out.
9. *Completely insulated oven.* Encircled with blanket "Super-Therm," 2½ in. thick on top and sides; 1½ in. in back wall.



Two small controls that make a big difference: oven valve, which lights oven automatically; oven chime for controlled preheating.

10. *High speed low temperature oven burner.* 250 to 550°.
11. *Superimposed, reinforced oven and broiler doors* with improved hinging.
12. *Porcelain drip tray.*
13. *One-piece porcelain top* integral with backguard.
14. *"Skyscraper" angle-iron frame construction* reinforced with welded steel base.
15. *Two modern range lamps.*
16. *Elevated flue construction.*
17. *Two condiment jars.*
18. *Grid lifter* for removing broiler grid.

WARD'S FLAME FENDER PREVENTS "Burning Out"

Here is one of the greatest talking points in favor of a Ward Floor Furnace—one of the results of the better engineering and construction that are so characteristic of the Ward.

Ward's Flame Fender (cast iron fire box) prevents "burning out"—a common cause of furnace failure. This unit of the Ward consists of an inner lining of heavy cast iron ¼" thick that surrounds the burner. It keeps the flame from impinging on the sides of the heating element. This protection *adds years to the life of the furnace!*

The Flame Fender is only one of the many construction features of the Ward that makes possible the 10-year guarantee on all Ward furnaces. You can sell the Ward with *confidence* because you know that back of every Ward is the 38 years' experience of the Ward Heater Company in manufacturing floor furnaces.

WARD HEATER COMPANY
1800 W. Washington Boulevard • Los Angeles 7, California
Since 1909

New!
Ward's Improved Bilt-In Thermo-Control
A complete package unit. Simple in design, entirely self-contained—requires no outside wiring. Safety Pilot is an integral part of the assembly.

PEOPLE

• A reorganization of the sales department of Cribben & Sexton Co. has been announced by **Harold E. Jalass,** general sales manager. The country has been divided into sales divisions with territory changes and new appointments resulting.

Fred F. Lauer, operating out of Newark, N. J., as Eastern division manager, will direct all company activities from Maine to Florida. Sales representatives in this division are: **Frank E. Brown,** Boston; **Carroll Rogers,** New York; **Patrick Downey,** Buffalo; **Joseph Brucher,** Philadelphia; **John Thornton,** Newark, and **Jack Sholine,** Atlanta.

Eleven states in the North-Central part of the country have been assigned to **John F. Schellenberg,** Central division manager, with headquarters in Chicago. Schellenberg's representatives are: **Stanley Jacobson,** Cleveland; **Edward Maag,** Indianapolis; **Albert Bradtke,** Detroit; **George Mohr,** St. Louis; **Charles Dukes,** Des Moines; **M. A. Ennis,** Omaha; **Tom Heneage,** Milwaukee; **Robert Erskine,** Minneapolis.

Metropolitan Chicago, formerly handled by Jalass, is now under the direction of **Frank H. Goetz** who was transferred from Michigan. Two men have been added to assist Goetz, **John C. Wilkinson** and **George Waber.** The South-West division will continue to be handled by **James J. Marcus** in Dallas, and **Charles R. Woodson,** Los Angeles, has been appointed Pacific division manager.

Three sales territories have not been placed under division managership. These areas will continue to be operated under the direct supervision of Jalass—Pittsburgh, **John McMahon;** Denver, **Eugene Sparks** and Kansas City, **Henry Shannon.**

• **Charles C. Martin,** a veteran of over 19 years in the plumbing and appliance field, is the new sales manager for Hoyt Heater Co., Los Angeles. He was formerly with Airway Electrical Appliance Corp., Toledo; General Electric Appliance Corp., and served three years as vice president and general manager of Rheem Research Products, Inc., subsidiary of Rheem Manufacturing Co. Martin succeeds **Arthur Dolan,** who has been with Hoyt for 13 years.

• **L. B. Denning, Jr.,** operating manager of the general division of distribution of Lone Star Gas Co., Dallas, has announced the appointment of **George A. Gott, Jr.,** as manager of the Cleburne district of distribution. Gott, who has been manager of the Arlington district of distribution since 1941, succeeds the late **Homer V. Smith.**

• **C. L. Hewitt, Jr.,** has been appointed general sales manager of the L. J. Mueller Furnace Co., Milwaukee, Wis., according to **Harold P. Mueller,** president. Hewitt returns to the company after an absence of nearly five years. Prior to that time he was Eastern sales manager of the firm for over 20 years. He served in the Army Air Forces during the war, and for the past year has been manager of sales, heating equipment department, Rheem Manufacturing Co.

• Roberts & Mander Corp., Hatboro, Pa., has announced the election of **John H. Emery** as vice president and sales manager. Emery was formerly manager of the New York office, but has transferred his activities to the home office at Hatboro to assume direction of the company's selling and marketing program. He succeeds **R. S. Agee. W. B. Eckenhoff** will continue as assistant sales manager.

James F. Doran, who has represented the company in New Jersey for over 15 years, succeeds Emery. His headquarters will be at One Park Ave., New York, and his main objective will be the direction of his firm's expanding promotional plans in his district.

• **Walter S. Hallanan,** chairman of the National Petroleum Council, has announced the appointment of **James V. Brown** of Washington, D. C., as secretary-treasurer of the Council, effective April 1. Brown has been identified with the oil industry for 20 years.

• **George L. Tyler** has resigned as secretary-treasurer of the California Natural Gasoline Association to join the petroleum chemicals division of E. I. Du Pont de Nemours & Co., Inc. He will be assigned to the Los Angeles district after a short time in the company's Wilmington office. Tyler is being succeeded by **E. R. Millett, Jr.,** consulting petroleum engineer.

• **Alfred J. Yardley** has been elected president of Jenkins Bros., manufacturers of valves, succeeding his father, **Farnham Yardley,** who becomes chairman of the board, after serving as president for the past 30 years. The company also has announced the election of **James L. Dunn,** vice president in charge of industrial relations, and **C. C. Chamberlain,** general sales manager, to the board of directors.

• **Robert W. Hadley** has been appointed president of The American Coach & Body Co., Cleveland, Ohio, and **Harold F. Smith** is the new treasurer. Both were elected directors of the firm.

• **R. S. Coffin,** president, Bailey Meter Co., Cleveland, Ohio, has announced the election of **H. M. Hammond,** general sales manager, and **P. S. Dickey,** chief engineer, as vice presidents. Hammond joined Bailey Meter Co. as a field engineer in 1919. He was assigned to the Ohio-Pennsylvania area, became Philadelphia branch manager in 1921, and in 1923 was appointed sales manager. He has written numerous technical papers on measurement and control as it is applied to power plants and industrial processes.

Dickey, who has been with Bailey Meter since 1925, became chief research engineer in 1934, special consultant on marine problems in 1940, and chief engineer in 1944. He, too, is the author of many technical articles on measurement and control and holds numerous patents on automatic control equipment.

• **Lloyd C. Ginn,** advertising and sales promotion manager of American Stove Co., has been appointed to the company's board of directors. He has risen through the ranks, beginning as an office boy 24 years ago. Ginn is chairman of the Domestic Range division of GAMA and is a member of seven committes of the American Gas Association and Liquefied Petroleum Gas Association.

Fred Lauer

H. E. Jalass

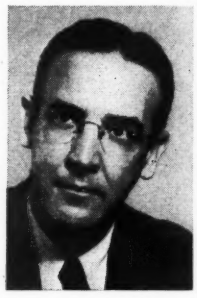
. . . Cribben & Sexton

C. L. Hewitt

James F. Doran

. . . sales executives

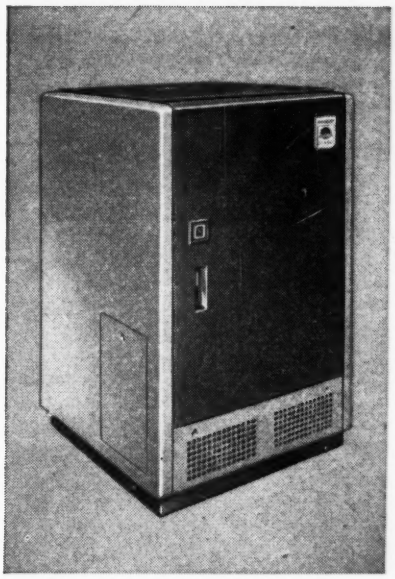
H. M. Hammond



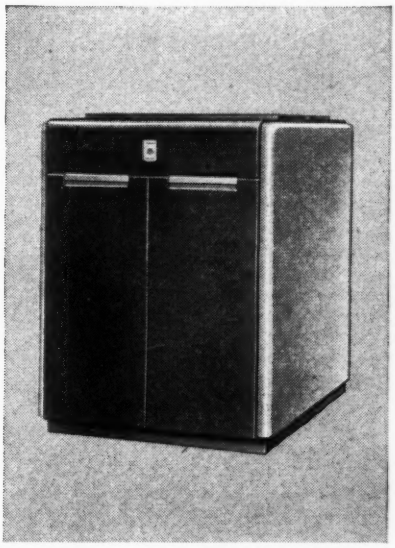
P. S. Dickey

. . . Bailey Meter Co.

You can assure your customers of many years of Efficient, Economical Heating



The **EMPIRE** Gas Boiler has all the features essential to perfect performance and customer satisfaction, including patented pin type cast iron sections—the most effective type of cast iron heat absorbing surface. Sections are joined with gas-tight, metal-to-metal fit to assure maximum combustion efficiency.



The **MOHAWK** Winter Air Conditioner has a quiet, dependable cast iron burner with patented high temperature alloy, corrugated ribbons. Rugged cast iron two-section heating element has precision ground faces and asbestos packed, leak-proof joints. Pre-heating of return air saves fuel, increases efficiency.

When you recommend AMERICAN-Standard
HEATING EQUIPMENT

AMERICAN-Standard
HEATING · PLUMBING

■ American-Standard gas fired heating equipment has been engineered by experts to get full customer satisfaction from every cubic foot of gas.

Excellent performance records make customers willing salesmen of gas as a fuel. You take advantage of this acceptance for your own lines when you recommend the modern gas fired boilers, water heaters, warm air furnaces and winter air conditioners that carry the familiar American-Standard Mark of Merit.

American Radiator & Standard Sanitary Corporation,
P. O. Box 1226, Pittsburgh 30, Pennsylvania.

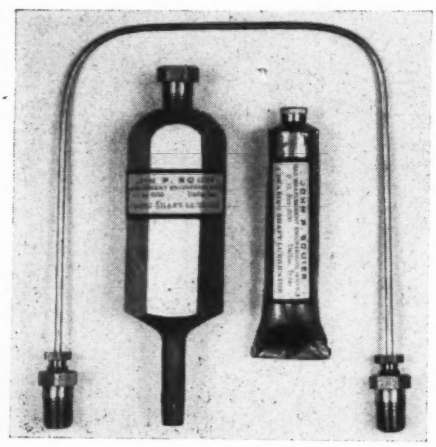
Serving the Nations' Health and Comfort

LOOK FOR THIS MARK OF MERIT—It identifies the world's largest line of Heating and Plumbing Products for every use . . . including Boilers, Warm Air Furnaces, Winter Air Conditioners, Water Heaters, for all fuels—Radiators, Convectors, Enclosures—Gas and Oil Burners—Heating Accessories—Bathtubs, Water Closets, Lavatories, Kitchen Sinks, Laundry Trays, Brass Trim—and specialized products for Hospitals, Hotels, Schools, Ships, and Railroads.

NEW PRODUCTS

Bearing Shaft Lubricator

John P. Squier Gas Measurement-Engineering Service, P.O. Box 6100, Dallas 2, Texas.
Model: Automatic Bearing Shaft Lubricator for Orifice Meters.
Application: Especially adapted for orifice meters manufactured with bearing shaft originating from low pressure mercury chamber. Constructed for operating pressures from 500 to 5000 psi.
Description: Hexagonal shape, one-piece construction permits ease of installation and retards possibility of connection leakage. The lubricator permits free action of shaft without leakage for two to three years without refilling. Possibility of over-lubrication of bearing shaft, prevalent in most present methods of lubrication which use hydraulic pressures and heavy lubricants, is eliminated. Entire unit is constructed for operating pressures to 5000 psi, electroplated for weather protection, and furnished with stainless steel tubing and connections.

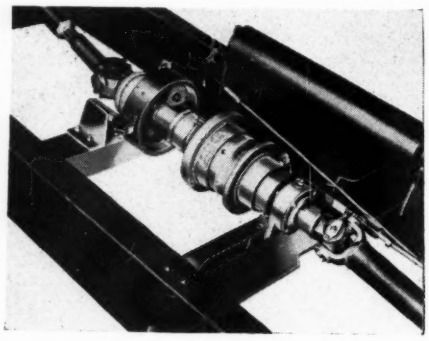


Reverse check valve presents flow of lubricant to high-side mercury chamber in case of sudden release of pressure from meter, or in case of backflow of measured product. Maximum sealing pressure on bearing shaft is about 3½ psi when differential pressure is 100 in. of water. This feature allows free action of shaft at all times without leakage, regardless of the rate of flow.

Each unit is furnished complete with lubricator, connecting tube, high pressure stuffing box connections, and tube of low viscosity lubricant prescribed for perfect operation. Installation is simple and rapid.

Power Take-Offs

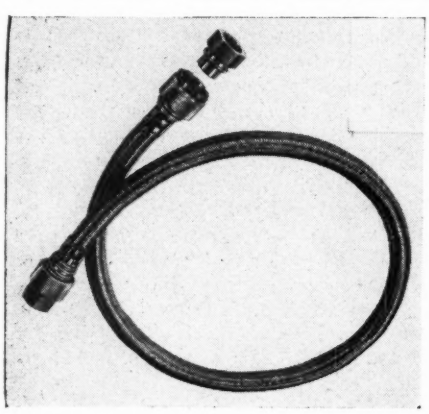
Davey Compressor Co., Kent Ohio.
Model: Heavy Duty Power Take-Offs.
Application: For driving truck-mounted machinery, requiring 10 to 100 hp for its operation, from the truck's own engine instead of through separate auxiliary engines.
Description: Uses as its basic principle an internal and external gear drive, operating as a strong and durable spline, rather than the series of rotating or meshing gears found in transmission type take-offs. Installation is made to the rear of the truck transmission case so the power take-off becomes an integral part of the drive shaft assembly for transmitting power direct from the truck engine through V-belts or chain drive.



The eight power take-offs in this firm's 1947 line are available in three separate capacities of 50, 75 and 100 h p. Model 50 (shown in illustration) is manufactured in both single and simultaneous drive designs. Models 75 and 100 are designed for single, simultaneous or double drive.

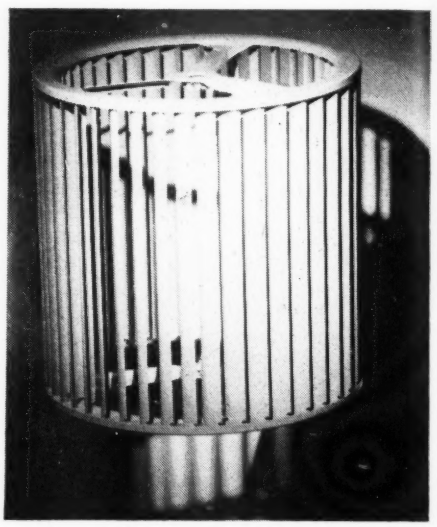
Flexible Gas Tubing

Carbo-Flex Hose Co., 5452 Vineland Ave., North Hollywood, Calif.
Model: Carbo-Flex Gas Tubing.
Application: A. G. A. approved for use with natural and manufactured gas in ½- and ¾-in. sizes. May be connected or disconnected in an instant.
Descritpion: Carbo-Flex comes equipped with a Wiggins quick coupling at both ends or at either end, as desired. A quick pull-push connects it with a tight, leakproof seal, and another quick pull disconnects it. The tubing has a heat and acid resistant neoprene lining. The outside may be ordered in stainless steel, monel, bronze, brass, copper, aluminum or other metals. The tubing is useful on home appliances, allowing removal from the wall for cleaning. Other uses are in the testing laboratories of plants, on portable space heaters, floor furnaces (portable or stationary), and throughout industry.



Blower Wheel

Utility Appliance Corp., 4851 S. Alameda St., Los Angeles 11, Calif.
Application: This improved blower wheel is of resistance welded, five-piece construction, with blades stamped from continuous steel strip. Maximum air delivery obtained consistent with maximum strength. Air delivery ratings are certified for all sizes and are derived from laboratory performance tests in accordance with the ASHVE Fan Test Code.
Description: Blade width is scientifically proportioned to each wheel diameter rather than using one standard blade width for various size wheels. This, together with aerodynamically determined blade angles, insures optimum performance for each wheel diameter. Dual drive, with hubs at each end, distributes wheel weight close to the bearings, reducing shaft and bearing loads and permitting increased power input. The end ring is designed with a venturi section throat for smooth air flow. The wheels are precision built and dynamically and statically balanced.



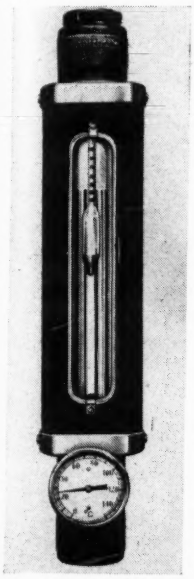
Thermometer Bulb

Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa.
Model: Thermohm.
Application: Extends the range of this firm's resistance thermometer recorders and controllers to temperatures as high as 1000 degrees F. It is accurate for the more exacting industrial requirements.
Description: With the Thermohm, speed of response is much faster than that of usual heavy-gauge couples and is matched only by small pipe-type or fine wire couples. Rugged and durably constructed, it is easy to install in ovens, tanks, ducts or pipe lines. Its own corrosion-resisting stainless tube gives ample protection for normal pressures and non-corrosive fluids. Like any thermocouple or thermometer bulb, the Thermohm can be used with protecting wells where required. The temperature coil is thoroughly protected against contamination by moisture or gases. It is equipped with a universal head that facilitates installation and connection. Standard lengths are 6 and 12 in.

Specific Gravity Tester

Fischer & Porter Co., Dept. 4E-B, Hatboro, Pa.

Model: Continuous Liquid Specific Gravity Indicator.



Application: Designed for continuous indication of fluid specific gravity in closed piping systems and for use in connection with distillation work and with process systems in which draining of sample batches is considered tedious or hazardous.

Description: This tester is reported to be sturdily constructed to withstand very heavy line strain, but at the same time it is attractive in appearance. Brackets, bezels and lighting accessories are available for adapting the device for front or rear panel mounting. Standard construction includes carbon steel, bronze, stainless steel or Hastelloy. Needle control valves, thermometers and hydrometers are built into the compact unit. High visibility by hydrometer and thermometer is claimed.

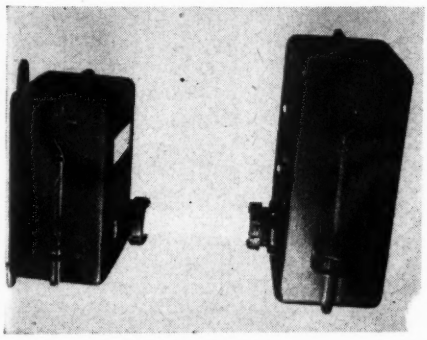
Smoke Indicator

Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.

Model: Photoelectric Smoke Indicator, Type A20C.

Application: Indicates the density of smoke passing through the flue or breaching of a heating or power plant, and signals when this density approaches the values prescribed by municipal smoke ordinances.

Description: The manufacturer claims that it is rugged in design, reliable in performance, simple to install, and low in cost. Basically consists of a photoelectric control and light source. These are mounted on opposite sides of the flue, and the light source beam is projected across the flue onto the photoelectric control. A sensitivity adjustment permits the equipment to be set so that it will signal when smoke density approaches whatever value is prescribed as maximum by the local municipal smoke ordinance.



Earth-Boring Tool

Hydrauger Corp., Ltd., 116 New Montgomery St., San Francisco, Calif.

Model: LHH-2.

Application: Developed for running in pipe leads.

Description: This horizontal earth-boring tool, light enough to be operated by one man, is reported to be consistently straight-boring for underground distances up to 50 ft. Power is provided by a 3.2 hp motor operated by 90 lb. of air pressure. The pilot bit hole of 2-in. diameter can be opened up by reaming to 3½ and 4½ in. For added handling ease, boring bar sections are only 2 ft. in length and weigh but 5 lbs. each.

LEVEL YOUR WINTER PEAK!

If you are confronted with peak winter demands for fuel, you can eliminate this problem. Install LP-GAS standby facilities and storage in adequate quantities against inadequate gas supply or interrupted service.

But—it is imperative that you stock your winter's supply of LP-Gas in the summer.

Like the gas utilities, the manufacturers of LP-GAS have peak load periods in the winter, too. Stock your winter's supply in the summer when the demand is lighter and delivery and storage are available.

WARREN'S broad experience, engineering advice and consultation service on LP-Gas conversion are available to you without cost or obligation.

Contact your nearest WARREN office today.

"1922-Silver Anniversary Year-1947"

WARREN PETROLEUM CORPORATION
TULSA, OKLAHOMA
Detroit Mobile Houston

Swing Check Valve

Falcon Products Co., East Second St., Pomona, Calif.
Model: Falcon-Greenwood High Pressure Check Valve.
Application: Built to offer all the advantages of the swing check type valve for oil, gas, steam, water, etc., but without the disadvantages of knocking or chattering.
Description: This valve is generally installed in a horizontal position but may be used in a vertical position for upward flow. The gate or "swing check" is pivoted on a vertical pin. The weight of the gate, therefore, is not a factor in closing the valve. Neither does the gate "float" on the liquid or gas causing it to flutter with the flow. Consequently, there is no rattling or chattering of the gate against the valve body. Free flow is assured by large full area rectangular passageways through the valve.

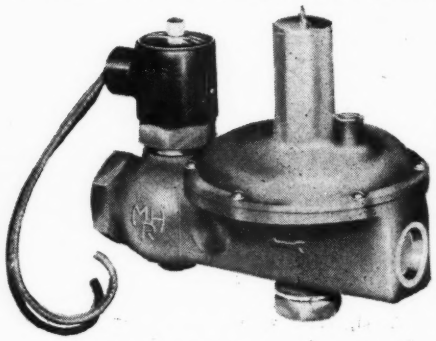
The gate is hinged on large bearings spaced widely apart. Instant closing of the valve is aided by flat, stainless steel spring mounted on back of swing gate. When flow ceases or is reversed, the spring gives the initial force to swing the gate quickly into the stream, instantly closing off the flow.

Made of high grade steel castings with internal parts of corrosion-resistant materials, each valve is individually tested to several times its working pressure. Available in sizes from 2 to 8 in. for 150 and 300 lb. working pressure.

ARCCO
ARCCO-MACNICK
"SPEED-LOK"
CHART
HUBS
Never get lost!
Now under production and ready for immediate delivery, the NEW Arcco-Macnick "Speed-Lok" Chart Hub will save valuable time in changing charts. ● Simple to operate with no cap or loose parts to become damaged or lost, this new hub locks the chart securely in the DESIRED POSITION without damage to center hole. ● Replace your antiquated two-piece hubs with the new Arcco-Macnick single unit "Speed-Lok" Chart Hub. Fits practically all tapered arbor chart clocks. Send for bulletin #114.
$1.50 (Lower prices in quantities)
AMERICAN
RECORDING CHART CO.
3113 E. 11th Street • Los Angeles 23, California
SEND FOR BULLETIN NO. 114

Gas Controller

Minneapolis-Honeywell Regulator Co., 2641 Fourth Ave So., Minneapolis 8, Minn.
Model: V482 and V882.
Application: For use with natural gas butane, propane, and sulphur gases. Eliminates need for manufacturers to buy separate valves and regulators and assemble them as one unit.
Description: This new control combines a solenoid gas valve and diaphragm regulator as one compact unit for domestic gas burners. Not scheduled for production until later in 1947 because of demand for standard products, the device has been test-proven to offer



many advantages, according to the manufacturer.

It is claimed that the combination design of a spring and weight-loaded regulator provides improved performance, while maintaining a desired pressure of an unvarying amount. Using a diaphragm of type N synthetic buna with a nylon insert, the regulator has a long life expectancy and is free from porosity, it is said. It will be available in ½- and ¾-in. sizes and will carry a pressure rating of 8 oz. per sq. in.

Metal for Leak Repairs

Metalon Manufacturing Corp., Bayonne, N. J.
Model: Metalon.
Application: For repairing leaks and plugging up holes in all types of pipes, radiators, furnaces, boilers, automobile cylinders, etc. Equally effective on all metals including brass, iron, aluminum, copper, lead, tin and babbitt.
Description: Composed of a combination of metals in powder form, together with a specially prepared liquid, Metalon hardens thoroughly in less than 30 minutes. The powder and liquid, when mixed, form a smooth paste that is applied to the crack or leak without the use of fire or heat.

PIPE LINE NEWS

United Gas Pipe Line

United Gas Pipe Line Co., Shreveport, La., has filed an application with the FPC requesting permission to construct about 93 miles of 18-in. pipe line from the Baxterville field in Marion county, Miss., to a connection with the company's line near Mobile, Ala. Permission was also requested to replace about 8½ miles of 12-in. pipe on the Mobile-Pensacola main line with 16-in. pipe and to loop a 6-in. tap line extending from the Mobile-Pensacola line to the Florida Pulp and Paper Co. near Cantonment, Fla., with about 3½ miles of 8-in. pipe.

Cost of the facilities has been estimated at $3,150,000. Financing will be from cash on hand or by a loan from United Gas Corp., the parent company.

Mississippi River Fuel

The Mississippi River Fuel Corp. has applied to the FPC for authority to construct and operate additions to its pipe line system to increase delivery capacity 83 MMcf per day by the winter of 1948-49. After installation of the new facilities, the company's total daily capacity would be 275 MMcf at the Perryville, La., compressor station, and its total sales capacity would be 266 MMcf per day.

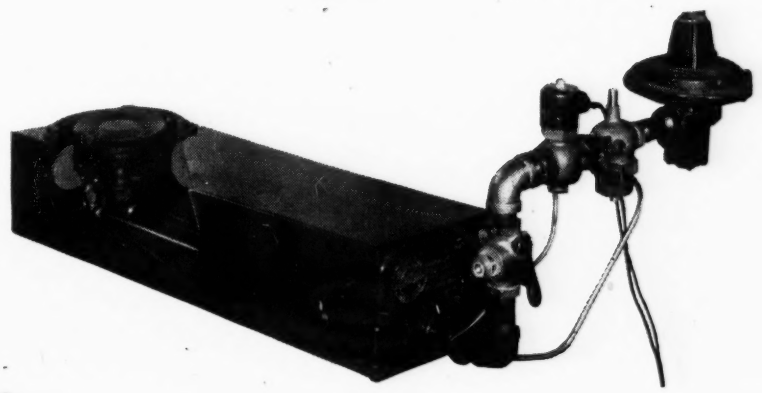
The gas made available through the proposed facilities would be used by Mississippi River Fuel to meet the increased demands of its existing customers, including both utility customers who buy gas for resale and industrial customers who buy gas for their own use.

Border Pipe Line Co.

The FPC has determined that the Border Pipe Line Co.'s construction and operation of facilities in Texas for exportation of natural gas from the United States to Mexico make it subject to FPC jurisdiction under the Natural Gas Act. The commission has issued the company a certificate of public convenience and necessity authorizing it to continue operation of an 1100-hp compressor station in Jim Hogg county, Texas, and a 38-mile, 8⅝-in. line from the station to the eastern bank of the Rio Grande, about seven miles south of Laredo, Texas.

The company has filed a petition for rehearing and stay of the FPC order.

JOHN ZINK
Luminous Flame
CONVERSION BURNER



for . . .
INDUSTRIAL and DOMESTIC
INSTALLATIONS

BURNS
- Natural Gas
- Manufactured Gas
- Liquefied Petroleum Gases

Luminous Flame Radiates
Heat 2 to 3 Times Faster
Than A Blue Flame

AVAILABLE FOR
VERTICAL or HORIZONTAL FIRING

—Write for Literature—

JOHN ZINK COMPANY
4401 S. Peoria -:- Tulsa 1, Oklahoma
New York - Salt Lake City - Houston - Los Angeles

Panhandle Eastern

The FPC has issued an order determining Panhandle Eastern Pipe Line Co.'s rights and duties in serving the Detroit and Ann Arbor, Mich., areas with natural gas under existing contracts with Michigan Consolidated Gas Co. The order supplemented an FPC order of Nov. 30, 1946, which authorized Michigan-Wisconsin Pipe Line Co. to construct the initial facilities of a 1069-mile Texas-to-Michigan system under certain conditions, a principal one of which was that the facilities were not to be used for the transportation or sale of gas to Michigan Consolidated for resale in Detroit and Ann Arbor, except with regard to the rights and duties of Panhandle Eastern, which is now selling and delivering gas to Michigan Consolidated for distribution in those areas.

The new order sets forth the following conditions: (1) Panhandle is permitted to deliver gas to Michigan Consolidated in accordance with the terms and conditions of its existing contracts during the life of such contracts. (2) Upon termination of such contracts, and upon mutually satisfactory terms, Panhandle is afforded reasonable opportunity to deliver and sell to Michigan Consolidated not less than the annual volumes of gas delivered and sold by it for either the years 1942 or 1945, or the average delivered for the five-year period 1942 through 1946.

Further, Panhandle shall have the right to participate in the future growth of the Detroit and Ann Arbor markets by being given the opportunity to deliver and sell such additional volumes of gas to Michigan Consolidated as the latter may require in excess of the volumes of gas then being contractually purchased by it from Panhandle and Michigan-Wisconsin in order to maintain adequate service to consumers in the Detroit and Ann Arbor districts.

Texas Eastern Transmission

Texas Eastern Transmission Corp., Houston, has filed with the FPC an application requesting authority to acquire and operate the Big and Little Big Inch lines and to construct and operate additional facilities to be attached to the Inch lines to transmit natural gas from the Gulf Coast to the Appalachian and Eastern Seaboard areas of Philadelphia and New Jersey. The company stated that at a later date it may request authority to enlarge its system to serve the Baltimore, New York and New England areas.

Proposed additional facilities include about 66 miles of lateral lines to connect the Inch lines with various gas distributing systems in the Philadelphia and New Jersey areas and 24 compressor stations with an aggregate of 122,000 hp, in addition to the three stations containing 18,000 hp to be constructed under a temporary certificate issued by the FPC on March 22. After completion of these facilities, the company stated the lines would have a capacity of approximately 425 MMcf per day.

The total capital cost has been estimated at $182,107,000, of which $143,127,000 represents the cost of the lines, and $38,980,000 represents the estimated cost of the new facilities.

Colorado Companies

Hearing on applications filed by Colorado Interstate Gas Co., and Colorado-Wyoming Gas Co., requesting authority to construct and operate additional pipe line facilities was scheduled by the FPC to begin April 21 in Denver, Colo.

The application of Colorado Interstate, originally filed in conjunction with Canadian River Gas Co., has now been amended to eliminate the latter company and make certain changes in the facilities to be constructed. The amended application requests authorization to construct and operate approximately 240 miles of 20-in. line from the vicinity of Denver to a proposed compressor station near Lakin, Kan. Cost of the facilities is estimated at $12 million.

Colorado-Wyoming has asked permission to construct 105 miles of 8- and 10-in. line from a point of connection to be made with Colorado Interstate's proposed Denver line to Cheyenne, Wyo., and a 1200-hp. compressor station to be located about 8 miles east of Denver. Cost is estimated at $1,415,000. The proposed construction is contingent upon FPC authorization of Colorado-Interstate's new line to Denver.

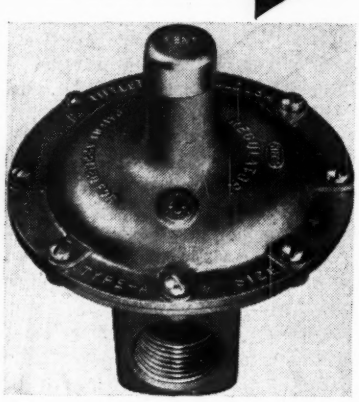
Mid-Continent Gas

The Mid-Continent Gas Transmission Co., St. Paul, Minn., has filed with the FPC a petition requesting withdrawal of its application for permission to construct and operate a pipe line system extending from the vicinity of Liberal, Kan., to Kansas City, Mo., and to St. Paul. The company indicated that its request for withdrawal was occasioned by its inability to confirm commitments of adequate gas reserves which were previously indicated as available.

HECO'S *New* PRECISION DIE-CAST
Gas Appliance REGULATOR

Designed, engineered and produced complete by Heco, units are individually tested to assure close control at minimum maintenance cost.

Available for Immediate Delivery



- PRESSURE DIE-CAST FROM FINEST ALUMINUM ALLOY
- BRASS-TO-BRASS SEAT
- CORROSION-RESISTANT INTERNAL PARTS
- LOWER SHIPPING COSTS
- CLOSE CONTROL
- HIGH CAPACITY
- LOW MAINTENANCE
- INDIVIDUALLY TESTED
- APPROVED BY A. G. A.

INSIST ON THE *New* HECO REGULATOR FOR PRECISION PERFORMANCE

New, too, is the line of HECO Precision Machined Brass Valves and Cocks. Write for prices, Catalog No. 47 G on the complete line, giving jobber's name.

TESTED AND ·HECO· PROVED PRODUCTS
HECKETHORN MANUFACTURING & SUPPLY CO.
LITTLETON, COLORADO, U.S.A.

A distinguished new member joins the RHEEM Heating Family

THE FRASER FURNACE LINE . . . for twenty-five years one of the leaders in the gas heating field—has joined the famous Rheem group of heating products. The merging of these two great heating lines will bring to both the advantages of expanded production facilities and wider design experience.

The Fraser line will be made up of the same extensive group of floor and basement furnaces, winter air-conditioning units, blowers, registers and grilles. And Fraser will continue with its present sales policy. The traditional high quality of Fraser products will be maintained and improved as new engineering developments are made.

To the present family of Fraser distributors and dealers, the Rheem organization extends a warm welcome. To future dealers, the Fraser division of Rheem offers a complete line of heating equipment, designed to give lasting satisfaction through the latest developments in heating engineering. Rheem, 570 Lexington Avenue, New York 22, N. Y.

RHEEM . . . *making houses into homes*

Public Opinion Report On Oil Industry Published

The American Petroleum Institute has announced publication of the 269-page book, "Those Who Know You Well—Think Well of You," which reflects the results of interviews with some 10,000 adults concerning their opinions in regard to the oil industry. Results of the survey are broken down into 18 different categories so that public opinion and knowledge on each question may be determined not only by sections of the country, but also by producing and refining areas, sex, age groups, race, urban or rural, type of employment, income level, union membership, politics, etc.

The volume is divided into three main sections: (1) A brief discussion of the most important findings; (2) a summary and analysis of all the results; and (3) the complete, tabulated returns from all of the questions. The current oil industry public relations program is primarily based on this survey.

Copies of the survey are available from the American Petroleum Institute, 50 West 50th St., New York 20, N. Y., at $4 each.

Test For Labor Act

Indiana House Bill 392, enacted into law by the 1947 Indiana General Assembly, which provides for compulsory arbitration in the settlement of labor disputes between public utilities and their employees, may be tested soon by the United Gas, Coke & Chemical Workers, CIO, Indianapolis, in a demand upon the Prospect plant of the municipally-owned Citizens Gas & Coke Utility of Indianapolis for union recognition and the correction of certain labor practices.

The union has filed a petition with the National Labor Relations Board for certification of employees of the utility, as a preliminary move to organize a drive for their demands on the utility. Although municipal employees generally are excluded from the protection of the National Labor Relations Act, union officials have advanced the claim that technicalities erected to remove the gas utility from politics tend to place its employees within the NLRB jurisdiction for collective bargaining purposes.

The union specifically charges that the utility dismissed five men for joining their union and offered a 15% wage increase while a drive for union members in the plants was in progress. An interesting "angle" to the situation is that the union has informed Indiana's governor, Ralph F. Gates, that "a critical situation is arising" and that a test of the new compulsory arbitration act enforcing arbitration to avoid strikes in public utility plants "may be forthcoming shortly."

The preliminary steps are expected to be long drawn out, and the result may not be known definitely for several months, but the seed of opposition to the new act has been sown, and will be watched with interest throughout the nation's utility industry.

Gas Heating Installations Reach Peak in 1946

"The growing acceptance of gas brought about in 1946 an all-time high in number of installations for home heating and automatic gas water heating," L. Wade Childress, president of Laclede Gas & Light Co., St. Louis, Mo., states in his annual report to stockholders.

"Six thousand new heating customers were added during the first six months, and 4000 automatic water heating customers during the year. In view of the shortage of natural gas it was necessary to stop all installations for home heating on July 12 and to refuse commitments for further installations as of that date. Until an increased supply of natural gas is available continued restrictions for home heating will be necessary."

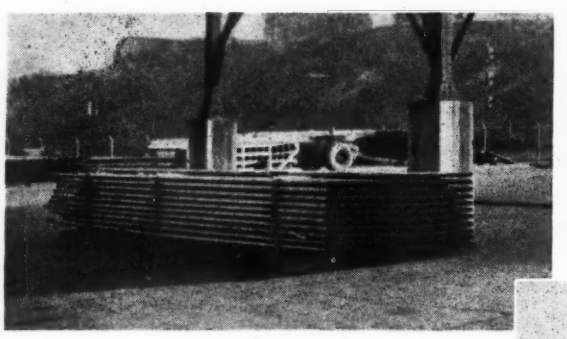
The company had a total of 219,790 customers of mixed gas in 1946, consisting of 208,376 residential, 9593 commercial and 1821 industrial.

Wage Increase Granted

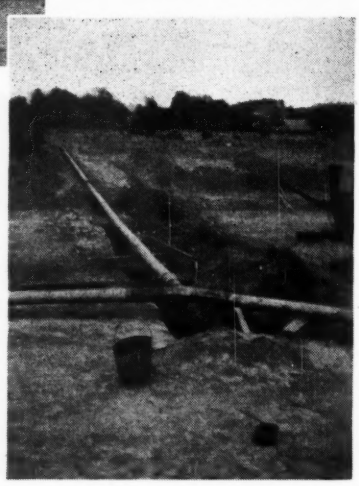
Representatives of the Utility Workers Union of America, CIO, recently came to an agreement with Southern California Gas Co., Los Angeles, on wages and working conditions until Feb. 29, 1948. Wage increases retroactive to Jan. 1, 1947, were agreed upon. The wage scales in the new contract are those proposed by the company to the union in its offer of Jan. 10, with a few exceptions in certain classifications.

Contract changes not relative to wages became effective on March 1. Chief among these were vacation and sick leave provisions and veterans' rights.

SERVICE PIPE PROBLEMS?



MANY LEADING UTILITIES STANDARDIZE ON HILL, HUBBELL COATED-AND-WRAPPED SERVICE PIPE!



- FACTORY APPLIED TO STANDARD SPECIFICATIONS
- CORROSION RESISTANT
- DIELECTRIC
- TIME TESTED
- ECONOMICAL
- EASILY STORED
- COMPLETE SIZE RANGE FROM ¾" NOM. AND UP

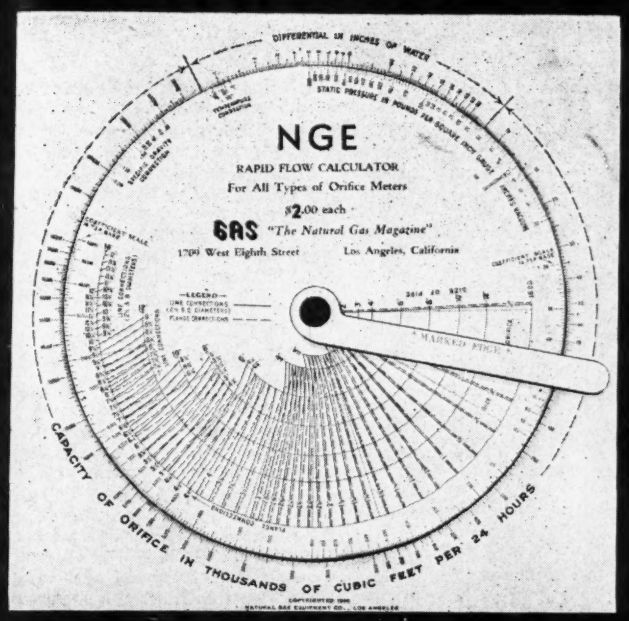
HILL, HUBBELL FACTORY APPLIED PIPE PROTECTION—is your protection against corrosion hazards common to pipe failures

Hill, Hubbell and Company
Division of GENERAL PAINT CORPORATION
3091 MAYFIELD RD. CLEVELAND, OHIO.

NGE RAPID FLOW

CALCULATOR

FROM 2 inches TO 16 inches


NGE
RAPID FLOW CALCULATOR
For All Types of Orifice Meters
$2.00 each
GAS "The Natural Gas Magazine"
1709 West Eighth Street Los Angeles, California
CAPACITY OF ORIFICE IN THOUSANDS OF CUBIC FEET PER 24 HOURS

. . . will quickly compute any of a series of variables in the transmission of natural gases.

SIMPLE to operate: Set dial . . . Turn indicator . . . *and instantly find*

1 COEFFICIENT and VOLUME
2 CORRECT ORIFICE SIZE IN ANY GIVEN VOLUME
3 DIFFERENTIAL PRESSURES

Our NGE CALCULATOR has been tested in field and desk use. Why not let it *help you* with your daily problems. If interested send in coupon and you will receive our calculator in a few days.

GAS
1709 West Eighth Street
Los Angeles 14, California

$2.00 EACH
25% discount on all orders for 25 or more

Gentlemen: Please send me.....NGE *Gas Flow Orifice Calculators* for which I am enclosing my check or money order for $..... *Add 2½% sales tax in California.*

NAME .....

COMPANY .....

ADDRESS .....

Furthermore . . . . Comfortaire is the dealer's friend . . . one style and type . . . *for either basement or closet installation.*

Delivers an even, comfortable flow of warmed air in winter, circulates a steady supply of fresh air in summer. It can easily handle the heating requirements of homes . . . offices . . . stores . . . or public buildings.

Exclusive new ideas incorporated in the heating elements, blower mount, air filter and other units, help to achieve a higher than standard of *automatic gas heating.*

History too, is being made by the new Hammel Wall Heaters and Gravity Furnaces. Write for information on the Hammel Dealer Franchise: It's a money-maker!

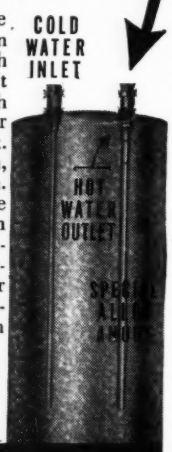
Hammel
RADIATOR ENGINEERING CO.
A. S. Martinson & Associates
Successors to Hammel Radiator Corp.
3348 Motor Ave. SINCE 1912 Los Angeles 34

"Elno" Trade Mark Registered RUST PREVENTER
For Steel Hot Water Storage Tanks

Rust NO LONGER A Must!

"ELNO" eliminates the need for expensive non-ferrous or specially-processed tanks even where water is so highly-corrosive that such tanks have always been considered essential. It is not like some chemical "rust inhibitors" which merely bleach discolored water and do little or nothing to prevent rust or protect the tank. "ELNO" really routs rust, requires no attention, and causes no further expense after installation.

Get set now to tap an important new source of profit by offering your customers maximum security against rust and corrosion in the equipment you sell and service. The field is broad because "ELNO" is available in types and sizes for all makes of heaters and boilers. Write for technical, catalog, price and promotional information today.



PATENT APPLIED FOR
The Cleveland Heater Co.
2310 Superior Ave. Cleveland 14, Ohio

CLEAN, RUST-FREE HOT WATER AT LOWEST EQUIPMENT COST

WILLIAMS BROTHERS
CORP.
ENGINEERS — CONTRACTORS

OIL • GAS • GASOLINE • WATER
PIPE LINES
AND
PUMP STATIONS

NEW YORK - TULSA - ATLANTA - HOUSTON

House of Science Opened

Two closely associated units—the Foundation of Applied Research and the Institute of Industrial Research — are sharing an integrated "house of science" opened April 6 on a 3000-acre strip of land near San Antonio. The project, well equipped with research laboratories, was made possible by the gift of valuable oil property by Tom B. Slick of San Antonio, an oil and ranch man as well as a successful inventor. Slick will advise on the planning of the scientific program under the direction of a board of trustees.

Dr. Gregory Pincus, head of the Worcester Foundation for Experimental Biology at Worcester, Mass., is selecting the research men and scientists who will staff the foundation and institute. The natural science department will include divisions of physics, chemistry, biology and more specialized sciences. Departmental publications of work accomplished will be issued, and other means of distributing useful information to the public will be used.

Cities Service Gas Co. Opens Wichita Office

S. B. Irelan, president of Cities Service Co. has announced the opening of operating department offices at 212 N. Market St. in Wichita, Kan., as of April 1. Some of the officials at the new office are: C. D. Rogers, supt. of operations; H. B. Milam, supt. of gas transportation; E. M. Rowland, supt. of compressor stations; Clarence Allen, supt. of pipe lines; C. A. Gibson, supt. of gas measurement, and A. J. Nagel, industrial relations.

In addition to the above mentioned, there are eight other department heads and 47 general employees in the new branch.

Clearwater Seeks Funds

City Manager Bennett, of Clearwater, Fla., seeking means of financing needed expansion of the city gas plant and distribution system, recently warned that it may be necessary to use part of the $100,000 in gas and water profits which last year helped swell the city's operating fund. Issuance of revenue certificates has been considered, Bennett said, and he refused to speculate on whether a tax increase would be necessary to fill the resulting gap in the operating fund.

Silver Anniversary

Warren Petroleum Corp.'s house organ, "The Natural Gasser," devoted its March issue to a special anniversary edition commemorating the company's 25th birthday on March 15. The book is devoted to a history of the firm and the men who have directed its growth, and to a review of the natural gasoline industry for 25 years. Six full-page illustrations show the Warren plant, equipment and leaders.

Bomb Casings Store Gas

At Shell Oil Co.'s Ten Section field in California, block-bluster bomb casings, have been welded to form 240-ft. cylinders for the storage of propane. These cylinders were laid in two horizontal banks of four each, with a shorter cylinder on top to provide vapor space for expansion. Each bank stores 25,000 gallons of propane.

Test Room Completed At Hartford Gas Co.

Gas men throughout Connecticut and Rhode Island, and particularly those in the customer service department of The Hartford (Conn.) Gas Co., are enthusiastic about the Gas Training Center Test Room which the company has set up. A back bench has been provided, equipped with all types of automatic controls and full facilities for testing and instruction on each type. There are several working models of the basic types of gas appliances. When a control causes trouble in the field, it is placed in the test room for examination and repair.

Several classes have been held for servicemen who work for the company's dealers, and one class brought in representatives from surrounding companies.

Plans for the future include a scheduled rotating instruction period for all servicemen on all types of appliances, as well as installation wrinkles for fitters and adjustment and lighting courses for dealers' servicemen. Regular twice-a-year refresher courses are scheduled on first aid. Manufacturers' representatives will from time to time be invited to give specialized classes on their appliances.

Community Public Service To Issue Securities

The Community Public Service Co., Fort Worth, Texas, has been authorized by the Federal Power Commission to issue $850,000 additional amount of first mortgage bonds, Series A, 3%, to be dated Nov. 1, 1946, and to mature on Nov. 1, 1969. Security will be by the Indenture of Mortgage and Deed of Trust dated as of Nov. 1, 1944, and supplemented March 1, 1947.

Proceeds obtained from the bond issue will be used to reimburse the company's treasury for expenditures for the construction, completion, extension or improvement of its facilities and for the repayment of short-term bank loans made to meet the cost of these facilities.

Resources Map Available

Harold Vagtborg, president, Midwest Research Institute, Kansas City, Mo., has announced the availability of a six-state regional resources map, which was recently compiled by the institute. Through the courtesy of the Gas Service Co., Kansas City, it has been reproduced and is available for distribution in modest quantities.

The map includes Nebraska, Iowa, Kansas, Missouri, Oklahoma and Arkansas and has been prepared to stress the significance of the mineral raw materials available to industry from this area.

Eutectic Granted Patents

R. D. Wasserman, president of the Eutectic Welding Alloys Corp., and head of its Research and Development Laboratories, has been granted two U. S. patents to apply a metallic coating, called Eutectofilm, to the line of low temperature welding alloys manufactured by the company.

Eutectofilm is applied to bare welding rods, and the following advantages are clamied for it: (1) Improves the welding characteristics of the rod. (2) Insures obtaining the high phyical properties in the the weld deposit. (3) Assists in surface alloying at low base metal heats. (4) Protects the filler rod from corrosive attack which would have detrimental effect on weld metal and its flow.

Memphis Hearing Postponed

The Federal Power Commission has postponed the hearing set for April 1, 1947, on the application filed by Memphis Natural Gas Co. for authority to acquire all of the gas assets of Kentucky Natural Gas Corp. and for Kentucky to sell such assets. The commission did not immediately re-schedule the hearing.

Postponement was made at the request of Memphis Natural.

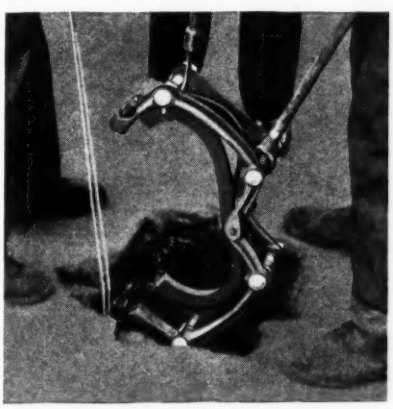
New Symbols Approved

A new American Standard covering 163 letter symbols, designed to give chemists and chemical engineers a uniform system of shorthand for use in their mathematical calculations, has been completed and is ready for distribution, P. G. Agnew, vice president, American Standards Association, has announced.

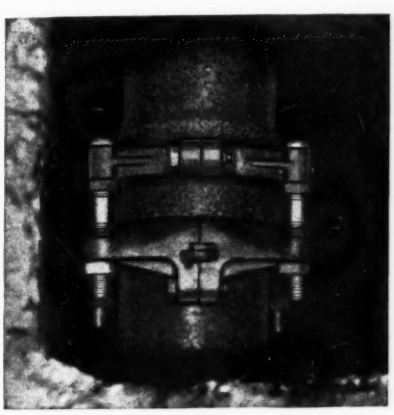
The symbols are designed to provide an agreed group of letter symbols which will permit a new degree of uniformity in writing and discussion of chemical problems, particularly in textbooks, scientific papers, lectures, etc.

NORMAC
BELL JOINT CLAMP

6 inch NORMAC clamp being lowered into hole for installation



6 inch NORMAC clamp in service after installation



Solves Your Joint Repair Problems

- QUICK
- EASY
- PERMANENT

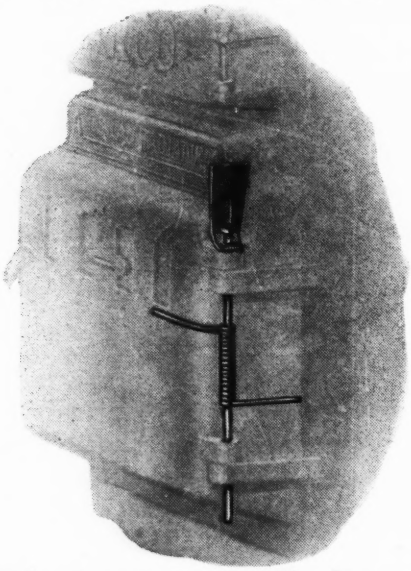
Installed in pavement openings 1' x 1'. Available in all standard sizes from 3" to 12". A simple set of tools cleans the joint, installs the clamp ... often in only a quarter of an hour. SAVES TIME. SAVES MONEY and the repair is permanent. Designed for all conditions particularly where pavement repair costs are prohibitive. Write for literature illustrating this simple solution to one of the Gas Industries most trying problems and ask for our catalog describing our complete line of

COUPLINGS ... FITTINGS
SERVICE TEES and ELLS
SLEEVES ... COMPRESSION-END COCKS ... COMPRESSION-END METER BARS

NORTON-McMURRAY MFG. CO.
39 SOUTH LA SALLE ST. ● CHICAGO 3, ILL.
Method and product covered by U.S. Patents, Nos. 2,163,261 and 2,178,286.

The Inland Door Closer

DESIGNED for CONVERSION BURNERS



OVER 50,000 IN USE

This device, designed for conversion burners, automaticallly closes the fire door of a boiler or furnace when blown open.

It consists of a cadmium plated door hinge pin, spring and wedge. The hinge pin replaces the regular fire door pins, the spring furnishes the motive power and the slotted wedge holds the fire door in the open position when required.

Furnished in 3/16 — 1/4 — 5/16 — 3/8" Sizes

INLAND MANUFACTURING CO.
1120 N. Cicero Avenue, Chicago, Ill.

CLIP THIS AND MAIL TODAY

IF YOU ARE NOT A REGULAR SUBSCRIBER TO **GAS**

In GAS each month you will find dozens of ideas that will help you know your business better and do your job better. Just one of these ideas coming to you on our pages can pay you many, many times the small cost of a subscription.

GAS ... 1709 WEST EIGHTH ST.,
LOS ANGELES 14, CALIFORNIA

Please enter my subscription to GAS for ...

1 YEAR $2.00 ☐

☐ Check is enclosed ☐ Please bill me

NAME_____ POSITION_____

COMPANY_____

STREET CITY ZONE STATE

ISO Plans Geneva Office

The International Organization for Standardization, set up at a meeting of 25 nations in London last October, has become an official body, following ratification of its constitution and bylaws by the national standards bodies of 15 nations, Charles leMaistre, secretary in charge of the provisional office, notified the American Standards Association from London recently.

Difficulties in securing office space at Geneva, Switzerland, which has been selected as permanent ISO headquarters, have been among the factors delaying the opening of an office. However, the technical work of the organization is going forward without delay.

Sales Permit Extended

The FPC has extended to Oct. 1, 1947, the temporary authorization under which Northern Natural Gas Co. is permitted to sell natural gas to Northern States Power Co. for resale in St. Paul, South St. Paul, West St. Paul and Rosetown, Minn. The authorization limits sales to Northern States Power to the volumes of gas required in excess of that supplied by Koppers Co. under contract to Northern States Power. Without extension the authorization would have expired on April 1, 1947.

Gas Service Extended

The town of Bay Minette, Ala., has formally signed a contract with Littrell Construction Co. for the installation of gas pipe lines to the local plant of Newport Industries, Inc., manufacturers of naval stores. The contract calls for expenditure by the town of $25,000 and completion of the work by May 1.

Four carloads of pipe already have been received for installation, and the project will require replacing the 3-in. line now bringing gas into the town with a 6-in. pipe for a distance of two miles.

Rockwell Managers Meet

The annual meeting of division managers of Rockwell Manufacturing Co. was held in March at the home office in Pittsburgh, Pa. Representatives were present for the three-day conference from the firm's 14 scattered plants. The meeting was conducted by W. F. Rockwell, Jr., president, who stressed the fact that the conference should lead to free interchange of technical and management know-how.

CPA Orders Revoked

As of March 31 the Civilian Production Administration in a blanket revocation order rescinded all but 10 of its orders. The only remaining control of interest to the gas industry is M-43, which deals with the uses of tin and the allocation of pig tin. All controls concerning construction are transferred to the Office of the Housing Expediter.

AFL Tie-In Defeated

Yard and outside workers of the Tampa (Fla.) Gas Co. recently voted against representation by an American Federation of Labor union. Louis Wolberg, representing the National Labor Relations Board, who conducted the election, said the vote was 75 against affiliation, 13 for it, with three voided ballots. Office workers were not included in the voters.

Johns-Manville

TRANSITE FLUE PIPE

for venting the modern "Freedom Kitchen"

Helps make the kitchen CLEAN and COOL . . gets rid of grease, smoke and odors
Comes in OVAL (as well as ROUND) for concealed installation between wall studs
Easy to handle - and it's an asbestos product... COMPLETELY RUSTPROOF!

Write for Brochure TR-13A

Address:

Johns-Manville

Box 290, New York, N. Y.

JOHNS-MANVILLE JM PRODUCTS

Here's **CONSOLE-ation**

for Appliance-short Dealers

Pacific

THERMOLATORS

VENTED CONSOLE HEATERS

Now in Production!

They're here—the new Pacific THERMOLATORS. Beautifully streamlined in appearance, highly efficient in performance . . . the truly modern development in console heaters.

Every community needs Thermolators . . . for inexpensive gas heat in homes, stores, churches, motor courts, or remote rooms in larger houses.

Get full information of all the Pacific lineup of outstanding gas heating equipment. Includes: Console Heaters, Floor and Dual Register Furnaces, Winter Air Conditioners, Basement Gravity Furnaces, Suspended Units and Duct Furnaces. Dealer Franchises are open in a number of territories—write for full particulars today.

Gas Heating Specialists for more than a third-of-a-century

PACIFIC

Pacific Heater Division

NACO MANUFACTURING CO.

P. O. Box 310, Huntington Park, California

FOR SALE
WATER GAS GENERATING EQUIPMENT

1—Gas Machinery Co. 5' Water Gas Set
1—Semet Solvay Co. 5' Water Gas Set
1—Comstock Steam Engine connected to Sturdevant Turbo Blower
1—5 H.P. General Electric Co. 220-volt motor connected to #4A Sturdevant Blower
1—10" Bore Steam fuel hoist and 1/4 ton charging bucket
2—Gauge boards, gauges, pyrometers, etc.
1—Fairbanks-Morse 3" x 2" x 4" Oil Pump (New)
1—Fairbanks-Morse 3" x 3" x 4" Oil Pump
1—Lot of accessory equipment for Water Gas Sets
2—Lasker Bros., Iron Works 150 H.P. 72" x 18' Horizontal return tubular boiler
2—3' x 68' Welded Steel Stacks
2—Steam driven boiler feed pumps
1—Cookson improved feed water heater
1—Lot of Boiler accessories
1—#3 Roots exhauster with Wachs vertical steam engine
1—#4 Roots exhauster with Wachs vertical steam engine
1—Scranton 6 x 4 x 6 Duplex Tar Dump
1—Chicago Pneumatic Tool Co. compressor, size 14 x 16 G.S.S.
1—Union Steam Pump Co. Compressor, size 14 x 16 x 15
1—W.A.B. Co. 18" x 14" compressor
1—8' x 14' Steel Shell Oxide Purifier
2—10' x 10' x 12' Cast Iron Purifiers with center Seal
—Chain Belt Co. oxide bucket hoist driven by Troy 6 x 6 vertical steam engine
1—Lot of assembly piping, valves, etc. for Purifier
1—10" Connelly Balanced Holder Regulator
1—P. H. & F. H. Roots Co., size #1 Rotary Station Meter
1—American Meter Co. #1562 Colorimeter, complete with accessory equipment.

ALSO A GREAT MANY OTHER ITEMS NOT MENTIONED

For further information, address

PENINSULAR UTILITIES CO.
Calumet, Mich.

THE ANSWER TO YOUR GAS ODORIZING PROBLEMS

Captan *Advantages*

1 Gas-Like Smell
2 Available
3 Volatile
4 Harmless
5 Economical
6 Easy to Handle
7 Uniform
8 Doesn't Fade Out

NATURAL GAS ODORIZING CO., INC.
7620 WALLISVILLE ROAD
HOUSTON, TEXAS

THE SALES FRONT

Lone Star Gas Co.

A training school on design and engineering of the year-round gas air-conditioner was conducted recently for Lone Star engineers and draftsmen by Servel, Inc., manufacturer of the units. Discussions were led by Don Mayne of Dallas, regional sales manager for air conditioning, and W. J. Hoeing of Evansville, Ind., Servel factory senior engineer for the air condition division. Lone Star men attended from Dallas, Fort Worth, Abilene, Wichita Falls, Denison, Greenville, Corsicana, Waco and Bryan.

Servel, Inc.

Servel, Inc., is cooperating with General Foods in its Swans Down cake flour contest scheduled for the month of April, according to R. J. Canniff, Servel advertising and sales promotion manager.

Thirty Servel gas refrigerators will be offered as prizes in the nationwide contest. Contestants will be asked to complete the sentence "I like Swans Down Honey Fudge Cake made the Mix-Easy way because. . . ." Entry blanks are to be distributed through local grocers. The contest closes May 10.

Public Service Co. of Colo.

In early 1946 the Dealers and Builders department of Public Service Co. of Colorado was expanded and reorganized in order to work more closely with dealers, builders, architects and distributors to assist them in selling more gas and electrical equipment. In addition to Roy G. Munroe, who supervised establishment of the department in 1942, Shad J. Tinsley was named supervisor of gas dealers' representatives, Jack T. Connors became supervisor of electrical dealers' representatives, and A. A. Roebke was selected to serve the architects and building contractors. The goal of these men has been to strengthen and capitalize on existing contacts between dealers and other company employees.

The department's most recent campaign has been the distribution of letters with a pamphlet entitled, "Natural Gas and the Use and Care of Gas Appliances and Equipment." Plumbers, heating contractors, builders and architects are urged to order a free supply of the booklets for distribution to their customers. Public Service Co. of Colorado is mentioned but briefly, and half the last page is left blank for a stamp or signature by the person distributing the booklet.

WANTED: YOUNG MAN, ENGINEERING EDUcation, with ability to write reports and make contacts. Preferably with publication experience. $300.00 per month. Give complete details of education and business experience in first letter. Address Box 25, GAS, 1709 W. 8th St., Los Angeles 14, Cal.

ENGINEER WANTED

"Engineer" preferably not over 40, for development design and testing of gasfired residential heating equipment. Should have experience with manufacturer of such equipment. Location East, steady employment with well-known manufacturer.

BOX 50, GAS
1709 W. 8th St., Los Angeles 14, Calif.

Hamilton Manufacturing Co.

A new selling tool, prepared by the Hamilton Manufacturing Co., Two Rivers, Wis., is this easel-type sales manual, arranged in sections, enabling the dealer or salesman to refer quickly to sales points or product features of most interest to a prospective buyer. The manual first covers the factors of

weather, time and work savings, safety, ease of operation and economy. The remaining sections give details on specifications, installation and a catch-all of general information.

Contained in a loose-leaf leather binder with folding easel attached, the pages are well illustrated. Copy is concise and to the point.

Mullins Mfg. Corp.

Mullins Manufacturing Corp. announces a new Youngstown Kitchen sound slide film that retail dealers can show to prospects or present before women's clubs and other organizations. The film, entitled "Dream Come True," shows how easy and inexpensive it is to change an old-fashioned kitchen into a modern, work-saving kitchen. Another new sound slide film, "The Youngstown Kitchen Story," is primarily for sales training work. This film shows the company's entire kitchen line and points out the tremendous modernization and new construction market.

American Gas Association

Enthusiastic response is reported from selected audiences who have seen "The Flame of Freedom," new 17-min. sound slide film, done in kodachrome against a background of the New Freedom Gas Kitchen. The story features the automatic gas range, refrigerator, water heater, clothes dryer, laundry, etc. The film is designed for salesmen, employees, home service classes, civic groups and schools. The price is $35 and a print will be sent on approval.

CURRENT READING

Getting the Most Out of Your Gas Cooking Equipment—A.G.A. This pamphlet is slanted toward volume cooking establishments. It states:

One sure method of reducing commercial cooking costs is to achieve the utmost in efficiency possible in any particular establishment. A large part of this efficiency can be realized right in the kitchen by observing common sense housekeeping rules in regard to gas cooking equipment. The overall discussion of this subject will be divided into three parts: First, keeping equipment clean; Second, the proper adjustment of gas cooking equipment; Third, sound economical practices in the use of gas cooking equipment.

Commercial cooking equipment, whether it be the heavy duty types found in large restaurants and hotel kitchens, or the counter appliances used in fountain and other lunch type establishments, is made to withstand hard and continuous usage. Like any other piece of equipment or machinery built to withstand hard use, it will not stand abuse. In the case of gas commercial cooking appliances this is especially true. They are built to do a certain maximum job and should be used to the fullest extent to gain maximum economy, but they should not be pushed beyond the limits of design and gas capacity. Otherwise the efficiency is lowered with a consequent increase in cost.

Home Service Training on the Job—A.G.A. The following is quoted from Bulletin No. 74, available from A.G.A. headquarters for 10 cents:

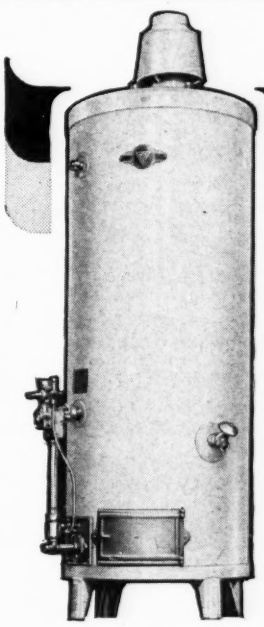
Sales managers have told us time and time again that "On the Job Training" has given them better results in their home service work. It has given the new people more of the attitude that they are a part of the company—an essential part of it—and that loyalty and interest in the work of the job inspires anyone to do better work.

There is a definite body of information which must be included in every home service training course regardless of differences in size, policies, and activities of companies operating home service departments.

1. Information which imparts to the new representative a thorough understanding of the aims and procedures of home service.
2. Technical information which will acquaint the student with the meaning of industry terms and the process by which gas is obtained and made available for use in the home.
3. Information on company policies, organization, customer relations and the dealer cooperative plan.
4. Home call and demonstration techniques.
5. The system of reporting and recording home service results.
6. Appliance instruction and the advantages of gas as a fuel in the home.
7. Kitchen planning, laundry and basement planning.
8. Sales training.
9. Supplementary training.

South Coles Levee Cycling Plant—This brochure describes the California cycling plant designed and constructed by The Fluor Corp., Ltd. This plant, fullly illustrated and described in a 32-page, color booklet, is typical of the new development to increase the productive life of a field by injecting stripped gas back into the reservoir. Besides the photographs, there is a four-color flow sheet which graphically depicts the various stages required in processing the well gas and condensate. Copies of this brochure are obtainable by writing The Fluor Corp., Ltd., 2500 S. Atlantic Blvd., Los Angeles 22, Calif.

Looking Forward in Oil — A World View—J. Howard Pew. This 16-page address was presented at a session of the 1946 annual meeting of the American Petroleum Institute. Copies of the booklet may be obtained from Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa.

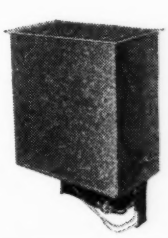


Outstanding
Quality...Styling...Value

Greater grows the demand for SECURITY Automatic Hot Water Heaters. More and more buyers seek the smart appearance, dependable performance, superior workmanship for which SECURITY is famed. Thousands of users are amazed at the efficiency, economy and long life of these gleaming Automatic Water Heaters. Operate on all fuel gasses. Now is the time to look to SECURITY . . . for leadership and for sales.

SECURITY
GAS FIRED SGP PRODUCTS
The "LONG-LIFE" LINE

OTHER POPULAR SECURITY AUTOMATIC GAS PRODUCTS are the Forced Air Winter Air Conditioners (below), Gravity Furnaces and Quick Hot Water Heaters. Designed for natural, artificial and L-P gasses. Write for complete information.



SECURITY MANUFACTURING CO.
1630 Oakland Avenue
Kansas City 3, Mo.

Veteran Housing

deserves the best!

Recommend the Gordon *Spreader-Flame* Conversion Gas Burner

● Made by the pioneers of the gas conversion industry. Over 100,000 in use today attest to the Gordon's dependability and satisfaction.

ROBERTS-GORDON APPLIANCE CORP.
137 Arthur Street • Buffalo 7, N. Y.

CONNELLY IRON SPONGE

For Real Gas-purifying Power

To get top efficiency in gas-purification at the lowest cost, use Connelly Iron Sponge. It's the finest purification material to be had.

Connelly Iron Sponge has a high degree of activity. It gives longer service before fouling. It revivifies more quickly. Leading gas companies have been using this "blue-ribbon" purification material for years — they know it can be relied upon to do the best job.

If you have a problem in gas-purification, take advantage of Connelly's 71 years of experience. Our engineers will be glad to help you . . . there is no obligation. Consult Connelly!

CONNELLY, INC.
3154 S. California Ave., Chicago 8, Illinois
Elizabeth, N. J. Los Angeles, Calif.

Immediate Delivery

METER CONNECTIONS

Straight Swivels and Nuts

Made of Screw-stock Steel, Electro-tinned

for use on 5-Lt. and 10-Lt. Meters

OTHER SIZES TO ORDER WRITE FOR PRICES

THE SCREWWERCS COMPANY
SYKESVILLE PENNSYLVANIA

Organic Nitrogen Compaunds — Published by Carbide and Carbon Chemicals Corp., a unit of Union Carbide and Carbon Corp., 30 East 42nd St., New York 17, N. Y. This 31-page booklet presents in detail the properties, specifications, and uses of the alkyl amines, alkylene amines, alkanolamines, and acetoacetarylamides. In chart form it gives their physical constants, comparative hygroscopicities, and neutralization curves. These compounds are used by various industries for many purposes such as emulsifying, neutralizing, synthesizing, dissolving, and saponifying.

The organic nitrogen compounds are extremely reactive; with acids they form salts or soaps; with esters, anhydrides, and acyl halides they form substituted amides; and with ketones, aldehydes, and alkyl halides they form other important derivatives. Many of the present applications of amines arise from their ability to neutralize acidic materials, such as in aqueous systems as corrosion inhibitors; in purification of gases by the removal or concentration of hydrogen sulfide or carbon dioxide; and in the formation of emulsifiers for polishes, cosmetics, insecticides, water paints, and cutting oils. They are widely used as intermediates in the production of dyestuffs, detergents, textile softeners, cement setting compounds, photographic and rubber processing compounds, anti-malarials, local anaesthetics, and pharmaceuticals. Newer uses for amines include ion-exchange and water-softening resins, germicides, flotation agents, petroleum emulsion breakers, gasoline additives, and catalysts.

Copies of this booklet may be obtained from any office of Carbide and Carbon Chemicals Corp., by asking for Form 4770.

Interrupted Quenching — C. H. Lekberg. This summary is quoted from Information Letter No. 10 published by the A.G.A. Committee on Heat Treating and Finishing With Gas:

1. At present there are three types of interrupted quenching; namely, Austempering — Isothermal Quench — and Martempering.
2. All three require the use of heated salt pots, operating, however, at temperatures in the range of normal drawing operations and comfortably below those required for hardening.
3. All three require facilities for rapid heat dissipation.
4. In addition to the intrinsic value of gas as a fuel, the availability of combustion air under pressure further enhances the position of gas for this application because these air facilities can be used to good advantage in providing a means for adequate heat dissipation.
5. All three eliminate or at least greatly reduce the tendency toward cracking and distortion inherent in the normal quench.

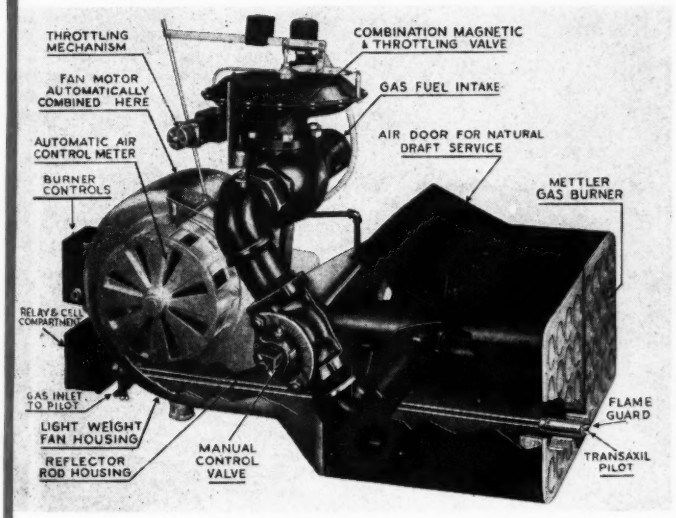
Subsurface Study of the Delhi Area, Franklin and Richland Parishes, Louisiana—P. A. Bloomer, Jr. —Published by Department of Conservation, Louisiana Geological Survey, Baton Rouge. This discussion is accompanied by a number of illustrations, maps and tables.

ENTRAINED COMBUSTION
REG. U.S. PAT. OFF.
EXPERTO CREDE

The Mettler "FAN-AIR" Gas Burner

LATEST MODEL FEATURES NEW AUTOMATIC SAFETY PILOT and TRIPLE CONTROLS

HERE IS A "FRONT VIEW" OF FAN-AIR BURNERS



Picture reveals essential and highly desirable POINTS of Fan-Air mechanical draft gas burners. Not just a gas burner but a COMPLETE AND FULLY AUTOMATIC BURNER SYSTEM, factory tested and ready for application when received. It comes to you complete as pictured with simple, dependable, automatic controls. No other burner so easy to install. Why be satisfied with less—when all these tangible advantages are so readily available. SIZES 5 to 400 HP.

LEE B. METTLER CO.

406 South Main Street

LOS ANGELES 13 CALIFORNIA

Reynolds

for Gas Control

FOR OVER FIFTY YEARS, Reynolds Gas Regulators have proven their ability in a field outstanding for its rigid requirements.

Proper regulation at the station; in the line; in industrial plants; in the home—for every kind and type pressure control equipment used in the gas industry, there is an especially designed product by Reynolds. Right down the line! From High Pressure to Low Pressure, from one ton to inches W. C., on big jobs or little jobs, one of the Regulators listed below will do a better job on your gas control.

REYNOLDS PRODUCTS

High Pressure Service House Regulators
Straight Lever Type—Model 10-20 Series,
Toggle Lever Type—Model 30 Series.

Low Pressure Service or Appliance Regulators

District Station Regulators
Single or Double Valve, Auxiliary Bowl and Automatic Loading Device Optional.

High Pressure Line Regulators
Pilot Loaded—Pilot Controlled

Toggle Type Regulators
Single Valve, Double Valve, Triple Outlet.

Seals: Dead Weight or Mercury

Relief Valves: High or Low Pressure

Back Pressure Valves
Automatic Quick-Closing, Anti-Vacuum Valves.

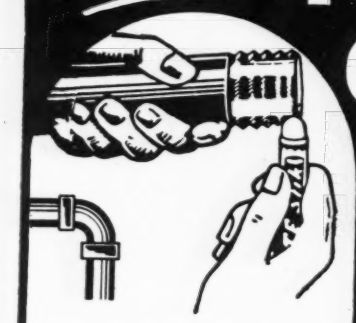
Automatic Shut-off Valves • Vacuum Regulators
Lever Operated Valves • Louver Operated Device
Atmospheric Regulators

GAS CONTROL SINCE 1892

REYNOLDS GAS REGULATOR CO.

ANDERSON, INDIANA, U. S. A.

NOW-PIPE JOINT COMPOUND in Stick Form



POSITIVE SEAL for GAS

Just rub 3 or more strokes across pipe threads. It spreads and fills threads when turned.

FOR ALL PIPE INSTALLATION AND REPAIR JOBS

Always Ready For Instant Use

ECONOMICAL—HANDY—CLEAN

Ideal for the Gas Industry

Tested and Fully Approved by Independent Laboratories and Industry.

WON'T DRY OUT

NO MESS BRUSH WASTE

Patented

Write for Free Sample and Prices

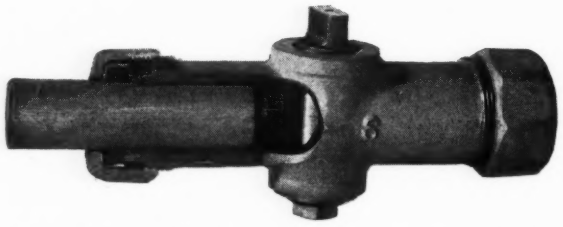
FEATURES

- You use only the exact amount of compound needed to form perfect seal—no waste.
- Cuts material and labor costs.
- Withstands vibration, temperature changes and deflection.
- Withstands pressures up to 2100 lbs.
- Joints can be remade without having to clean threads.

Lake Chemical Company

636 N. WESTERN AVE CHICAGO 12, ILLINOIS

Copyr. 1947 Lake Chemical Co.



Stopcocks with Compression Gasket Ends

(Cutaway Section Shows Depth and Assembly)

Iron Body Brass Core Stopcocks

Meter Bars

4-Types - - - Numerous Styles

Brass Lever Handle Control Valves

The LATTIMER-STEVENS COMPANY

715 Marion Road **Columbus 7, Ohio**

Catalogs

• **Wheelco Instruments Co., Chicago 7, Ill.**—Bulletin No. 3-6400 is a 20-page three-color book entitled "Wheelco Electronic Controls." Measuring and control systems; the electronic control principle; multronic, proportioning, automatic positioning and program control are explained with graphs, diagrams and photographs. Millivoltmeter, potentiometer and resistance thermometer controllers are shown, as well as indicating pyrometers and resistance thermometers, input controllers, portable pyrometers and potentiometers and selector switches. Contains listings and specifications on standard instruments, and a separate four-page price list is attached.

• **Worthington Pump and Machinery Corp., Harrison, N. J.**—The following catalogs have been issued: W-484-B1 "General Service Type GA Rotary Pumps"; L-802-B2, "Aftercoolers for Air and Gas"; H-620-B26, "Air King Compressors"; W-487-B10B, "Heavy Duty Type GR Rotary Pumps for 500 Psi"; W-412-B30A, "Horizontal Duplex Plunger Power Pumps—Types KLF-KMF"; W-411-B10, "Horizontal Duplex Power Pumps for Volatile Liquids"; W-113-B10 "Horizontal Side Pot Pumps for Refinery Service"; and WP-1099-B42A, "Oil Field and Pipe Line Equipment."

• **Dravo Corp., Pittsburgh, Pa.**—Bulletin 516 outlines the successful application of stainless steel to combustion chambers used in the self-contained, direct fired warm air Counterflo heater designed for industrial and commercial use. Other advantages claimed by the company and discussed in this catalog are: more efficient combustion by the Counterflo method; ready fuel convertibility from oil to gas or vice versa; elimination of refractory lining within the combustion chamber; longer life expectancy; lighter weight; compactness; and wide range of application.

• **Caterpillar Tractor Co., Peoria 8, Ill.**—Form 9781, "Pipeline Pumping Oil Schedule," outlines typical diesel engine applications for pumping petroleum products from oil fields to consumers, stressing the use of such engines as prime pumping units and as booster units in gathering stations to maintain a continuous flow of oil and gas. The eight-page color booklet also shows the application of diesel engines to rotary drill and mud pump operation and of diesel-powered tractors to pipe line laying chores.

• **Cochrane Corp., Philadelphia 32, Pa.**—A new 35-page booklet describes the firm's four deaerators designed for four different services. They are the tray type, atomizing, hot water and coil water. Other sections are devoted to accessories for deaerators and the role of alkalinity in preventing corrosion.

• **American Car and Foundry Co., 30 Church St., New York 8, N. Y.**—"Tank Car Classifications For Ladings" is the title of a 32-page booklet covering tank car specifications. Charts, tables and drawings explain specific ICC requirements.